



Final Drainage Report

Windermere Filing No. 2 El Paso County, Colorado

PCD File No.: PPR2442

Prepared for:

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Prepared: April, 2026

Kimley»Horn



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CERTIFICATION

ENGINEERS STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.



SIGNATURE (Affix Seal): _____

Noah M. Brehmer, P.E.
Colorado P.E. License No. 63226

_____ Date

DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Colo Windermere #2, LLC
Business Name

A handwritten signature in black ink, appearing to read "JTS", written over a horizontal line.

James Todd Stephens
By:

Owner
Title:

4164 Austin Bluffs Parkway, #361 Colorado Springs, CO 80918
Address:

EL PASO COUNTY

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code, as amended.

Joshua J. Palmer, P.E.
County Engineer/ECM Administrator

Date

Conditions:

GENERAL LOCATION AND DESCRIPTION

PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to provide the hydrologic and hydraulic calculations and to document and finalize the drainage design methodology in support of the approximately 104 single-family attached unit development, known as Windermere Filing No. 2 subdivision (“the Project”) for Colo Windermere #2, LLC (“the Client”). The Project is located within the jurisdictional limits of El Paso County (“the County”) and Sand Creek Drainage Basin. Thus, the guidelines for the hydrologic and hydraulic design components were based on the criteria outlined by the County.

The site was studied as part of the approved Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1, by Classic Consulting (October 2014) and the more recently approved Final Drainage Report for Windermere Filing No. 1, by Drexel, Barrel & Co. (April 2022).

LOCATION

The Project is located at 7653 Mardale Ln. at the northwest corner of the North Marksheffel Road and North Carefree Circle intersection in El Paso County, Colorado. More specifically, the East ½ of Section 29, Township 13 South, Range 65 West of the 6th P.M., Tract B, Windermere Filing No. 1 (parcel number 53294-16-011). The site is bounded by Windermere Filing No. 1 subdivision (Mardale Lane) to the North, North Marksheffel Road to the east, North Carefree Circle to the south, and Antelope Ridge Drive to the west. A vicinity map has been provided in the **Appendix** of this report.

DESCRIPTION OF PROPERTY

The Project is located on approximately ±9.13 acres of partially developed over lot graded land with limited vegetation and grass cover. The site currently provides stormwater quality and detention with a full spectrum extended detention basin and there are no known major drainage ways or irrigation facilities on site. The site generally drains from west to east with slopes ranging from 2% to 25%. There is an existing private on-site Full Spectrum Extended Detention Basin at the east end of the Site that accepts flows from most of the Property. The Project is not adjacent to any major drainageways and does not outfall directly to any major drainageways.

PROJECT CHARACTERISTICS

The Project is a proposed townhome subdivision development that will include approximately 104 single-family attached units platted as individual lots. The project will include the construction of private streets, driveways, hardscape/landscape, and associated utility and storm infrastructure required to serve each lot. Water quality and detention is required for the site improvements and will be accomplished with the existing onsite private full spectrum extended detention basin located at the east end of the site. As part of the utility infrastructure improvements, a proposed storm sewer system will be constructed to collect runoff. Stormwater will be conveyed via overland flow across the lots, and within curb and gutter before being captured in proposed storm inlets. The storm sewer system will then convey runoff into the full spectrum extended detention basin before being discharged into an existing public area inlet at the southeast corner of the site.

SOILS DATA

NRCS soil data is available for the Site (See **Appendix**) and the onsite soils are 100% USCS Hydrologic Soil Group A or Truckton sandy loam. Group A soils have higher infiltration rates compared to other soil groups and are generally made up of well drained, cohesive sands or gravelly sands. Additionally, a subsurface soil investigation performed by Entech Engineering on January 25, 2022, can be found in the **Appendix**.

EXISTING VEGETATION

The existing site is currently partially developed. Ground cover consists of limited native grasses, shrubs, and various stormwater pond infrastructure to include some concrete and stone riprap. Based on visual inspection the site currently is 50% vegetated.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

The existing storm facilities follow the El Paso County Drainage Criteria Manual (the “CRITERIA”), El Paso Engineering Criteria Manual (the “ECM”), and the Mile High Flood District Urban Storm Drainage Criteria Manual (the “MANUAL”). Site drainage is not significantly impacted by such constraints as utilities or existing development. Further detail regarding onsite drainage patterns is provided in the Proposed Drainage Conditions Section.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the existing drainage system per chapter 6 of the CRITERIA. Table 6-2 of the CRITERIA is the source for rainfall data for the 5-year and 100-year design storm events. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table 6-6 of the CRITERIA by calculating weighted impervious values for each specific site basin. The detention storage requirement was calculated using Full Spectrum Detention methods as specified in the CRITERIA and MANUAL. The Full Spectrum Extended Detention Basin’s outlet structure was designed to release the Water Quality Capture Volume (WQCV) in 40 hours. Based upon this approach, the drainage design provided for the Site is in keeping with the historic drainage patterns for the Site.

HYDRAULIC CRITERIA

The proposed drainage facilities are designed in accordance with the CRITERIA and MANUAL. Floodplain identification was determined using FIRM panels by FEMA and information provided in the CRITERIA. Hydraulic calculations were computed using Storm CAD using the Standard Method. Results of the hydraulic calculations are summarized in the **Appendix**.

VARIANCES FROM CRITERIA

There are no proposed variances from the El Paso County Drainage Criteria.

FLOODPLAIN STATEMENT

The Site is located outside the 100-year floodplain and within Zone X (an area of minimal flood hazard) as noted on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel #08041C0543G dated December 7, 2018 (See **Appendix**).

MAJOR DRAINAGE BASIN – HISTORIC HYDROLOGY

The previously approved *Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1* by Classic Consulting (October 2014) will be reference for the existing off-site basins that have not changed from the time of the Classic Consulting report.

EXISTING DRAINAGE CONDITIONS

The existing Site was over lot graded as part of the original *Windermere Filing No. 1 development* and studied as part of the previously approved *Final Drainage Report for Windermere Filing No. 1*, by Drexel, Barrell & Co. (April 2022). A private on-site Full Spectrum Extended Detention Basin was designed as part of *Windermere Filing No. 1*. The design basis for the pond was to mitigate the potential for future grading within the stormwater pond facility area. Therefore, it was assumed that the final proposed build-out watershed imperviousness would be 68% for the Site. Additionally, an interim outlet plate was installed to control the release rate for the undeveloped condition.

The following basin descriptions reference the Windermere Filing No. 2 Preliminary Drainage Report prepared by Drexel, Barrell & Co., dated August 2024. The proposed conditions map will be utilized as the Existing Conditions for this Final Drainage Report. Please reference the existing conditions drainage map, historic conditions drainage map, and Preliminary Drainage Report in the **Appendix**.

ON-SITE

Sub-Basin B2

Sub-basin B2 is 6.63 acres and consists of central majority of the Site. This basin consists of a partially developed over lot graded area and is partially vegetated with a soil stockpile. The runoff developed within this sub-basin sheet flows generally from northwest to southeast overland before being discharged into the existing detention facility. Slopes in this sub-basin range from approximately 2-5%. The weighted imperviousness of this sub-basin is 65%. The developed direct runoff from sub-basin B2 is 11.8 cfs for the 5-year event and 26.0 cfs for the 100-year event.

Sub-Basin B4

Sub-basin B4 is 0.93 acres and consists of the south end of the Site. This basin consists of a vegetated drainage ditch and accepts flows from off-site sub-basin D16. The runoff developed within this sub-basin sheet flows generally from west to east overland before entering an existing area inlet at the southeast end of the site. Flows then enter the existing stormwater network. Slopes in this sub-basin range from approximately 2-5% with steeper slopes along the pond embankment and drainage swale slopes. The weighted imperviousness of this sub-basin is 27%. The developed cumulative direct runoff tributary to design point DP 4A is 5.0 cfs for the 5-year event and 11.7 cfs for the 100-year event.

Sub-Basin E3

Sub-basin E3 is 1.10 acres and consists of the existing full spectrum extended detention basin for the site. The runoff developed within this sub-basin is treated and stored in place and then discharged to the southeast into existing stormwater infrastructure. The pond embankments are generally at a 3:1 slope. The weighted imperviousness of this sub-basin is 0%. The developed direct runoff from sub-basin E3 is 0.08 cfs for the 5-year event and 4.5 cfs for the 100-year event. This sub-basin is also tributary to design point DP 3 which accounts for all sub-basins tributary to the existing detention basin and has an cumulative tributary area of 11.74 acres and developed direct runoff flows of 19.40 cfs for the 5-year event and 44.80 cfs for the 100-year event.

Sub-Basin E5

Sub-basin E5 is 0.63 acres and consists of the east end of the site. This sub-basin consists of a vegetated existing drainage swale. The runoff developed within this sub-basin sheets flows overland at slopes of approximately 2-5% with steeper slopes along the pond embankment and travels south into an existing area inlet at the southeast corner of the site. Flows then enter the existing public stormwater network. The weighted imperviousness of this sub-basin is 0%. The developed direct runoff from sub-basin E5 to design point DP 5 is 0.4 cfs for the 5-year event and 2.4 cfs for the 100-year event.

OFF-SITE

Sub-Basin OS1

Sub-basin OS1 is 3.82 acres and consists of an off-site area north of the proposed development. This basin consists of fully developed residential lots and roads. The runoff developed within this sub-basin sheet flows generally from northwest to southeast at slopes of approximately 2-15% where it flows into existing curb and gutter and subsequently into sub-basin E1 and existing curb inlets. Flows are then conveyed through an existing 24" stormwater pipe that eventually discharges into the north end of the existing detention basin (sub-basin E3). The weighted imperviousness of this sub-basin is 65%. The developed direct runoff from sub-basin OS1 is 7.0 cfs for the 5-year event and 15.5 cfs for the 100-year event.

Sub-Basin E1

Sub-basin E1 is 0.03 acres and consists of the asphalt and sidewalk area adjacent to sub-basin OS1 and the existing curb inlets at the existing northeast entrance to the Site. The runoff developed within this sub-basin sheet flows generally from northwest to southeast at slopes of approximately 2%. Sub-basin OS1 is tributary to sub-basin E1 and the weighted imperviousness is 100%. Therefore, the developed cumulative direct runoff tributary to design point DP 1 is 7.1 cfs for the 5-year event and 15.7 cfs for the 100-year event.

Sub-Basin OS2

Sub-basin OS2 is 0.16 acres and consists of an off-site area northeast of the site. This sub-basin consists of the rear yards of the lots within sub-basin OS1. The runoff developed within this sub-basin sheet flows from the northwest to the southeast overland at slopes of approximately 2-15%. Flows then enter an existing private area inlet and are conveyed through an existing 24" storm pipe that discharges into the north end of the existing detention facility (sub-basin E3). The weighted imperviousness of this sub-basin is 65%. The developed direct runoff from sub-basin OS2 is 0.3 cfs for the 5-year event and 0.6 cfs for the 100-year event.

Sub-Basin D16

Sub-basin D16 is 2.73 acres and consists of an offsite area west of the site. This sub-basin consists of the Pronghorn Meadows Subdivision Filing No. 2 which is residential lots, roads, and a portion of North Carefree Circle. The runoff developed within this sub-basin sheet flows from the northwest to the southeast at slopes of approximately 2-5%. Flows travel into existing curb and gutter which conveys flows to an existing curb inlet and through an existing 24" culvert under Antelope Ridge Dr. Flows then enter sub-basin B4 and travel overland through an existing drainage ditch to an existing area inlet where flows then enter the existing stormwater network. The weighted imperviousness of this sub-basin is 65%. The developed direct runoff from sub-basin D16 up to the design point DP 4 at the existing curb inlet is 4.7 cfs for the 5-year event and 10.3 cfs for the 100-year event.

Sub-Basin NC2

Sub-basin NC2 is 1.61 acres and consists of an offsite area generally west and south of the site. This sub-basin consists of Mardale Ln., Antelope Ridge Dr., and North Carefree Circle. The runoff developed within this sub-basin sheet flows from the crown of the existing roads and into existing curb and gutter and eventually into an existing curb inlet at design point DP 19 in the southeast end of the site at slopes of approximately 2-5%. Flows travel into existing storm pipes on North Carefree Circle. In the event the curb inlet is clogged, flows would bypass into the existing on-site area inlet at design point DP 5 in the southeast corner of the site. The weighted imperviousness of this sub-basin is 83%. The developed direct runoff from sub-basin NC2 is 6.4 cfs for the 5-year event and 12.2 cfs for the 100-year event.

Sub-Basin NC1

Sub-basin NC1 is 0.43 acres and consists of North Carefree Circle. This sub-basin consists of paved asphalt road. The runoff developed within this sub-basin sheet flows at slopes of approximately 2-5% into existing curb and gutter and into the existing curb inlets within North Carefree Circle right-of-way. Flows then enter the existing public stormwater network at design point DP 20 in the southeast corner of the site. In the event the curb inlets become clogged some of the flows would enter the existing area inlet at design point DP 5 in the southeast corner of the site. The weighted imperviousness of this sub-basin is 93%. The developed direct runoff from sub-basin NC1 is 1.9 cfs for the 5-year event and 3.4 cfs for the 100-year event.

Per the PDR by D&B August 2024: Design Point S is located at the same existing public area inlet as DPS in the existing condition. In the developed condition flows reaching this point, from DP4A, DP5 and Basin EXR in addition to the pond release rate will equal $Q_5=7.7$ cfs and $Q_{100}=25.3$ cfs. Flows exit this existing public area inlet by existing public 24" RCP to the south.

Also, per the PDR by D&B August 2024: Design Point J1 is located at the existing public manhole on the north side of N. Carefree Circle and represents the combining of flows from DP-19 and DP-S. Flows of $Q_5=10.7$ cfs and $Q_{100}=23.6$ cfs continue to the south via the existing public 30" RCP towards DP-20.

Finally, per the PDR by D&B August 2024: Design Point 20 consists of surface runoff from basin NC-1, flowby from the at-grade inlet at DP-19 and pipe flow from DP-J1. An existing public 10' Type R sump inlet intercepts all the surface runoff and combines it with the upstream flows from DP-J1 and DP-19 existing at-grade inlet capture. Total developed runoff at this location is $Q_5=11.8$ cfs and $Q_{100}=25.7$ cfs. This runoff continues within the existing Marksheffel Road storm system to the south. Should the inlet be clogged, the resulting runoff will continue east via the neighboring curb and gutter.

Sub-Basin EXR

Sub-basin EXR is 0.53 acres and consists of an offsite area northeast of the site. This sub-basin consists of Marksheffel Rd and associated median. The runoff developed within this sub-basin sheet flows at slopes of approximately 2-5% into existing curb and gutter ultimately into an existing curb inlet and travels through an existing 24" storm pipe that travels east and then south within the Marksheffel Rd. right-of-way. The weighted imperviousness of this sub-basin is 100%. The developed direct runoff from sub-basin EXR is 2.4 cfs for the 5-year event and 4.4 cfs for the 100-year event.

EXISTING OFF-SITE DESIGN POINTS TRIBUTARY TO EX. DETENTION BASIN

Existing Design Point 1X

Existing Design Point 1X accounts for the off-site flows from existing sub-basins OS1, OS2 & E1 (Reference PDR, Drexel, Barrel & Co., August 2024 in the **Appendix**) that are tributary to the on-site existing private above ground full spectrum extended detention basin. There are 2 existing curb inlets at the northeast corner of the site (intersection of Mardale Ln. and Wyedale Ln.) that capture off-site flows from existing sub-basins OS1 & E1 (reference existing conditions drainage map from PDR, Drexel, Barrell & Co., August 2024) and convey them via existing stormwater infrastructure (existing private 24" RCP) into the existing stormwater facility. Inlet calculations can be referenced in the **Appendix** taken from the Final Drainage Report for Windermere Filing No. 1 by Drexel, Barrell & Co., March 8, 2022. Additionally, off-site flows from existing sub-basin OS2 (Reference PDR, Drexel, Barrel & Co., August 2024 in the **Appendix**) are tributary to the on-site existing private above ground full spectrum extended detention basin. There is an existing private area inlet at the northeast corner of the site (rear yard of existing Lot 73) that captures these off-site flows via an existing 2' X 6" concrete swale from existing sub-basin OS2 (reference existing conditions drainage map from PDR, Drexel, Barrell & Co., August 2024) and conveys them via existing stormwater infrastructure (existing private 24" RCP) into the existing stormwater facility. Existing imperviousness for existing sub-basins OS1 & E1 is 65% and the existing imperviousness of existing sub-basin OS2 is 100%. Total existing stormwater runoff conveyed to DP 1 during the 5-year and 100-year events are 7.50 cfs and 16.40 cfs respectively.

PROPOSED DRAINAGE CONDITIONS

The proposed project site is approximately ± 9.13 acres in size and involves the construction of approximately 104 single-family attached units, site access, pedestrian ramps, curb and gutter, private roads, turn lane, retaining walls, parking areas, sidewalk, wet & dry utilities, and stormwater infrastructure. Flows generated from the drainage area's proposed conditions are captured and conveyed via proposed stormwater infrastructure to an existing private above ground full spectrum extended detention basin. Flows are released from this pond from an existing outlet structure, existing orifice plate, and existing pipe with restrictor plate into an existing public stormwater infrastructure network. Flows generated from the proposed conditions generally follow historic drainage patterns. The total studied drainage area is approximately ± 18.55 acres with an overall weighted imperviousness of 61%. Under proposed conditions the entire drainage area tributary to the existing detention facility is approximately ± 11.86 acres with a weighted imperviousness of 61%. The proposed flows generated that are tributary to the existing detention facility for the 5-yr and 100-yr storm event are approximately 26.13 cfs and 58.33 cfs respectively. The overall proposed flows for off-site and on-site generated for the 5-yr and 100-yr storm events are approximately 40.54 cfs and 89.93 cfs respectively. The existing

detention facility sizing, inlet capacity, and pipe sizing calculations can be found in the **Appendix**.

PROPOSED SUB-BASINS TRIBUTARY TO EX. DETENTION BASIN

Sub-Basin P1

Proposed sub-basin P1 is approximately 0.51 acres and consists of proposed townhomes, landscaping, proposed sidewalk, and private asphalt drives along the northwest property line adjacent to the intersection of Mardale Lane and Antelope Ridge Drive. Stormwater runoff developed within this sub-basin generally travels southeast at grades of 2-9%. Stormwater runoff is conveyed via curb and gutter to a proposed private 5' CDOT Type-R curb inlet at design point DP D1. Flows are then conveyed through proposed storm infrastructure ultimately to the existing private above ground full spectrum extended detention basin. Developed proposed stormwater runoff during the 5-year and 100-year events are 1.27 cfs and 2.72 cfs respectively. The weighted imperviousness of proposed sub-basin P1 is 66%.

Sub-Basin P2

Proposed sub-basin P2 is approximately 0.40 acres and consists of proposed townhomes, landscaping, proposed sidewalk, and private asphalt drives in the northern central portion of the property adjacent to the northern property line adjacent to Mardale Lane. Stormwater runoff developed within this sub-basin generally travel southeast at grades of 2-7%. Stormwater runoff is conveyed via curb and gutter to a proposed private 5' CDOT Type-R curb inlet at design point DP D2. Flows are then conveyed through proposed storm infrastructure ultimately to the existing private above ground full spectrum extended detention basin. Developed proposed stormwater runoff during the 5-year and 100-year events are 1.01 cfs and 2.22 cfs respectively. The weighted imperviousness of proposed sub-basin P2 is 64%.

Sub-Basin P3

Proposed sub-basin P3 is approximately 0.74 acres and consists of proposed townhomes, landscaping, proposed sidewalk, and private asphalt drives along the western end of the property adjacent to proposed sub-basin P10. Stormwater runoff developed within this sub-basin generally travel southeast at grades of 2-5%. Flows are conveyed via curb and gutter to a proposed private 5' CDOT Type-R curb inlet at design point DP D3. Stormwater runoff is then conveyed through proposed storm infrastructure ultimately into the existing private above ground full spectrum extended detention basin. Developed runoff during the 5-year and 100-year events are 2.64 cfs and 5.07 cfs respectively. The weighted imperviousness of proposed sub-basin P3 is 88%.

Sub-Basin P4

Proposed sub-basin P4 is approximately 1.39 acres and consists of proposed townhomes, landscaping, proposed sidewalk, and private asphalt drives located within the central western portion of the property adjacent to sub-basin P3. Stormwater runoff developed within this sub-basin generally travels southwest and northeast at grades of 2-7%. Flows are conveyed via curb and gutter and convene to a proposed private 5' CDOT Type-R curb inlet at design point DP D4. Flows are then conveyed through proposed storm infrastructure ultimately to the existing private above ground full spectrum extended detention basin. Developed proposed stormwater runoff during the 5-year and 100-year events are 4.32 cfs and 8.66 cfs respectively. The weighted imperviousness of proposed sub-basin P4 is 78%.

Sub-Basin P5

Proposed sub-basin P5 is approximately 0.49 acres and consists of proposed sidewalk, and landscaping located in the central western portion of the site adjacent to proposed sub-basin P4. Stormwater runoff developed within this sub-basin generally travels southwest overland within a proposed grass swale into a proposed CDOT Type C area inlet at design point DP D5. Flows are then conveyed through proposed storm infrastructure ultimately to the existing private above ground full spectrum extended detention basin. Developed proposed stormwater runoff during the 5-year and 100-year events are 0.24 cfs and 1.48 cfs respectively. The weighted imperviousness of proposed sub-basin P5 is 11%.

Sub-Basin P6

Proposed sub-basin P6 is approximately 1.68 acres and consists of proposed townhomes, landscaping, proposed sidewalk, and private asphalt drives located in the central eastern portion of the site adjacent to proposed sub-basin P7 and the existing stormwater facility. Stormwater runoff developed in this sub-basin generally travel southeast at slopes ranging from 2-5% via curb and gutter into a proposed private 5' CDOT Type R curb inlet at design point DP D6. Flows are then conveyed through proposed storm infrastructure ultimately to the existing private above ground full spectrum extended detention basin. Developed proposed stormwater runoff during the 5-year and 100-year events are 5.81 cfs and 11.19 cfs respectively. The weighted imperviousness of proposed sub-basin P6 is 87%.

Proposed sub-basins P11 and P12 are both tributary to proposed sub-basin P6. Therefore, the cumulative total stormwater runoff tributary to proposed design point DP CD6 for the 5-yr and 100-yr storm events are 8.25 cfs and 16.53 cfs respectively. The total tributary area for combined design point DP CD6 is approximately 2.61 acres. Cumulative runoff calculations are in the proposed CIA calculations and can be found in the **Appendix**.

Sub-Basin P7

Proposed sub-basin P7 is approximately 0.29 acres and consists of landscaping and proposed sidewalk located in the middle of proposed sub-basin P6 within the central portion of the site. Stormwater runoff developed within this sub-basin generally travel southeast at slopes ranging from 2-5% overland within a proposed grass swale into a proposed private CDOT Type C area inlet at design point DP D7. Flows are then conveyed through proposed storm infrastructure ultimately to the existing private above ground full spectrum extended detention basin. Developed runoff during the 5-year and 100-year events are 0.30 cfs and 1.15 cfs respectively. The weighted imperviousness of proposed sub-basin P7 is 23%.

Sub-Basin P9

Proposed sub-basin P9 is approximately 1.16 acres and consists of the existing private above ground full spectrum extended detention basin, proposed sidewalk, and existing pond maintenance road located within the eastern portion of the site adjacent to North Marksheffel Road. Stormwater runoff developed within this sub-basin generally travels south overland at existing 3:1 pond side slopes and at slopes ranging from 2-3% within the existing concrete trickle channel where flows are then released via the existing control structure at design point DP D9 and discharge from an existing 18" pipe into existing stormwater infrastructure. Developed runoff during the 5-year and 100-year events are 0.25 cfs and 3.01 cfs respectively. The weighted imperviousness of proposed sub-basin P9 is 3%.

Design point DP 1X, DP 1A, and DP 1B were added to the proposed conditions drainage map for reference as to the existing, proposed, and combined total flows tributary to the existing detentions basin. Design point DP 1X includes existing tributary off-site flows from existing sub-

basins OS1, OS2, & E1 (reference PDR by D&B for drainage map and associated calculations). Design point DP 1A include proposed tributary flows that enter the existing detention basin (reference proposed drainage map by Kimley-Horn in the **Appendix**). Finally, design point DP 1B include both flows from design points DP 1 and DP 1A. The table below outlines these flows in detail.

Design Point	Storm Event	
	5-year (cfs)	100-year (cfs)
DP 1X (Existing tributary flows)	7.50	16.40
DP 1A (Proposed tributary flows)	18.63	41.93
DP 1B (Combined flows 1X + 1A)	26.13	58.33

Sub-Basin P10

Proposed sub-basin P10 is approximately 0.20 acres and consists of proposed landscaping, and proposed sidewalk along the western property line adjacent to Antelope Ridge Drive. Stormwater runoff developed within this sub-basin generally travels south at grades of 2-5%. Stormwater runoff travels overland within a proposed grass drainage swale into a proposed private CDOT Type C area inlet at design point DP D10. Stormwater runoff is then conveyed through proposed storm infrastructure ultimately into the existing private above ground full spectrum extended detention basin. Developed proposed stormwater runoff during the 5-year and 100-year events are 0.22 cfs and 0.75 cfs respectively. The weighted imperviousness of proposed sub-basin P10 is 27%.

Proposed off-site sub-basin OP10A is tributary to proposed sub-basin P10. Therefore, the cumulative total stormwater runoff tributary to proposed cumulative design point DP CD10 for the 5-yr and 100-yr storm events are 0.20 cfs and 0.72 cfs respectively. The total tributary area for design point DP CD10 is approximately 0.26 acres. Cumulative runoff calculations are in the proposed CIA calculations and can be found in the **Appendix**.

Sub-Basin OP10A

Proposed sub-basin OP10A is approximately 0.05 acres and consists of the off-site portion of proposed sub-basin P10 with existing landscaping, and proposed sidewalk along the western property line adjacent to Antelope Ridge Drive the western property line along Antelope Ridge Drive. Stormwater runoff developed within this sub-basin generally travels southeast at grades of 2-5%. Stormwater runoff travels overland into proposed sub-basin P10 at design point DP OD10A and then within a proposed grass drainage swale ultimately into a proposed private CDOT Type C area inlet at design point DP D10. Stormwater runoff is then conveyed through proposed storm infrastructure into the existing private above ground full spectrum extended detention basin. Developed proposed stormwater runoff at design point DP OD10A during the 5-year and 100-year events are 0.02 cfs and 0.13 cfs respectively. The weighted imperviousness of proposed sub-basin OP10A is 13%.

Sub-Basin P11

Proposed sub-basin P11 is approximately 0.51 acres and consists of proposed townhomes, landscaping, proposed sidewalk, and private asphalt drives in the northern central portion of the property adjacent to Mardale Lane. Stormwater runoff developed within this sub-basin generally

travels southeast at grades of 2-5%. Stormwater runoff is conveyed via curb and gutter into proposed sub-basin P6 at DP D11. Stormwater runoff then travels within proposed sub-basin P6 and into proposed storm infrastructure ultimately into the existing private above ground full spectrum extended detention basin. Developed proposed stormwater runoff at design point DP D11 during the 5-year and 100-year events are 1.38 cfs and 3.08 cfs respectively. The weighted imperviousness of proposed sub-basin P11 is 61%.

Sub-Basin P12

Proposed sub-basin P12 is approximately 0.42 acres and consists of proposed townhomes, landscaping, proposed sidewalk, and private asphalt drives located in the northeastern portion of the site adjacent to the intersection of Mardale Lane and Wyedale Lane. Stormwater runoff developed within this sub-basin generally travels southwest at grades of 2-5%. Stormwater runoff is conveyed via curb and gutter into proposed sub-basin P6 at design point DP D12. Stormwater runoff then travels within proposed sub-basin P6 and is conveyed through proposed storm infrastructure to the existing private above ground full spectrum extended detention basin. Developed proposed stormwater runoff at design point DP D12 during the 5-year and 100-year events are 1.16 cfs and 2.49 cfs respectively. The weighted imperviousness of proposed sub-basin P12 is 66%.

PROPOSED SUB-BASINS & DESIGN POINTS NOT TRIBUTARY TO EX. DETENTION BASIN

Sub-Basin P8

Proposed sub-basin P8 is approximately 0.80 acres and consists of landscaping, and proposed sidewalk located in the southern portion of the site adjacent to North Carefree Circle. Stormwater runoff developed within this sub-basin generally travels southeast at slopes ranging from 2-5% overland within a proposed grass swale into an existing public CDOT Type C area inlet. Flows are then conveyed through existing storm infrastructure that travels south within North Marksheffel Road. Developed proposed stormwater runoff at design point DP D8 during the 5-year and 100-year events are 0.07 cfs and 1.83 cfs respectively. The weighted imperviousness of proposed sub-basin P8 is approximately less than 0.1%. Additionally, existing off-site sub basin D16 contributes stormwater runoff into proposed sub-basin P8 of 4.70 cfs and 10.30 cfs for the 5-year and 100-year event, respectively (reference existing conditions drainage map in the PDR).

Proposed sub-basin OP8A is tributary to proposed sub-basin P8. Therefore, the cumulative proposed stormwater runoff tributary to design point DP CD8 for the 5-yr and 100-yr storm events is 0.07 cfs and 1.85 cfs respectively.

Under existing conditions, this sub-basin flows off-site into the existing stormwater infrastructure as stated above. The intention with the proposed grading in this sub-basin is to improve the existing drainage conditions to convey flows effectively without causing adverse erosive stormwater runoff impacts. The sub-basin will essentially be a grass lined drainage swale to match historic drainage patterns and convey flows to the existing stormwater infrastructure.

Exclusion I.7.1.C.1.a

Given the natural constraints imposed by the existing topography of the site and the design considerations of the project, it is not practicable to capture stormwater runoff from this sub-basin. Therefore, per El Paso County Engineering Criteria Manual I.7.1.C.1.a, 0.61 acres of

proposed sub-basin P8 is excluded from the Water Quality Capture Volume given it is not practicable to capture this runoff as it does not drain toward the existing control measure. The remaining 0.19 acres of sub-basin P8 is captured by the existing storm network at the southeast corner of the site. Additionally, the overall imperviousness of this sub-basin is 0%.

The table below depicts the historical design point 6 (Reference Existing Conditions Map by Classic Consulting, September 2014), existing design point DP S (Reference Proposed Drainage Map by Drexel, Barrell & Co., August 2024), and proposed (Reference current Proposed Conditions Drainage Map, Design Point A) flows tributary to the existing CDOT type D grated area inlet.

Conditions	5-year event (cfs)	100-year event (cfs)
Historic	18.4	42.6
Existing	7.7	25.3
Proposed	7.21	17.90

Sub-Basin P8A

Proposed sub-basin P8A is approximately 0.05 acres and consists of landscaping, and proposed sidewalk located in the southwest portion of the site adjacent to North Carefree Circle. Stormwater runoff developed within this sub-basin generally travels southeast at slopes ranging from 2-5% overland into existing curb and gutter along North Carefree Circle and ultimately into an existing public 15' at grade curb inlet. Flows are then conveyed through existing storm infrastructure that travels south within North Marksheffel Road. Developed proposed stormwater runoff at design point DP D8A during the 5-year and 100-year events are 0.11 cfs and 0.25 cfs respectively. The weighted imperviousness of proposed sub-basin P8A is approximately 61%.

Exclusion I.7.1.C.1.a

Given the natural constraints imposed by the existing topography of the site and the design considerations of the project, it is not practicable to capture stormwater runoff from this sub-basin. Therefore, per El Paso County Engineering Criteria Manual I.7.1.C.1.a, all of proposed sub-basin P8A (0.05 ac) is excluded from the Water Quality Capture Volume given it is not practicable to capture this runoff as it does not drain toward the existing control measure.

Sub-Basin P8B

Proposed sub-basin P8B is approximately 0.02 acres and consists of landscaping, and proposed sidewalk located in the southeast portion of the site adjacent to North Carefree Circle. Stormwater runoff developed within this sub-basin generally travels southeast at slopes ranging from 2-5% overland into sub-basin OP2 via existing curb and gutter along North Carefree Circle and ultimately into an existing public 10' sump condition curb inlet within the median of North Carefree Circle. Flows are then conveyed through existing storm infrastructure that travels south within North Marksheffel Road. Developed proposed stormwater runoff at design point DP D8B during the 5-year and 100-year events are 0.06 cfs and 0.11 cfs respectively. The weighted imperviousness of proposed sub-basin P8B is approximately 79%.

Exclusion I.7.1.C.1.a

Given the natural constraints imposed by the existing topography of the site and the design considerations of the project, it is not practicable to capture stormwater runoff from this sub-basin. Therefore, per El Paso County Engineering Criteria Manual I.7.1.C.1.a, all of proposed

sub-basin P8B (0.02 ac) is excluded from the Water Quality Capture Volume given it is not practicable to capture this runoff as it does not drain toward the existing control measure.

Sub-Basin OP8A

Proposed sub-basin OP8A is the offsite portion of sub-basin P8 and is approximately 0.01 acres and consists of landscaping, located in the southwest corner of the site adjacent to North Carefree Circle. Stormwater runoff developed within this sub-basin generally travels east at a slope of approximately 5% overland into sub-basin P8 ultimately into an existing public CDOT Type C area inlet. Flows are then conveyed through existing storm infrastructure that travels south within North Marksheffel Road. Developed proposed stormwater runoff at design point DP OD8A during the 5-year and 100-year events are 0.00 cfs and 0.02 cfs respectively. The weighted imperviousness of proposed sub-basin OP8A is approximately less than 0.1%.

Exclusion I.7.1.C.1.a

Given the natural constraints imposed by the existing topography of the site and the design considerations of the project, it is not practicable to capture stormwater runoff from this sub-basin. Therefore, per El Paso County Engineering Criteria Manual I.7.1.C.1.a, all of proposed sub-basin OP8A (0.01 ac) is excluded from the Water Quality Capture Volume given it is not practicable to capture this runoff as it does not drain toward the existing control measure.

Sub-Basin P13

Proposed sub-basin P13 is approximately 0.56 acres and is generally the existing sub-basin E5 as described in the existing conditions of the preliminary drainage report. This sub-basin consists of existing landscaping at the east end of the site adjacent to North Marksheffel Road. Stormwater runoff generally flows south overland and slopes ranging from 2-15% into an existing public CDOT Type C area inlet at design point DP D13. Flows are then conveyed through existing public storm infrastructure off-site south along North Marksheffel Road. It is understood that these flows are not anticipated to discharge directly into the existing detention basin which is consistent with the existing design and runoff conditions. Developed proposed stormwater runoff at design point DP D13 during the 5-year and 100-year events are 0.05 cfs and 1.34 cfs respectively. The weighted imperviousness of proposed sub-basin P13 is approximately less than 0.1%.

Proposed sub-basin OP13A is tributary to proposed sub-basin P13. Therefore, the cumulative stormwater runoff tributary to design point DP CD13 for the 5-yr and 100-yr storm event is 0.05 cfs and 1.35 cfs respectively.

This sub-basin is not counted towards the proposed exclusion area for disturbed area for the project site given there is no proposed development within this sub-basin. Under existing conditions, this sub-basin conveys stormwater to the existing public area inlet and the intent is to match this historic drainage pattern under proposed conditions.

Furthermore, it is not practicable to capture stormwater runoff into the existing stormwater facility given this is on the back side of the existing pond embankment and the proposed conditions do not impact this area in terms of grading and development.

Sub-Basin OP13A

Proposed sub-basin OP13A is tributary to sub-basin P13 and consists of the off-site portion of proposed sub-basin P13 and is part of the existing sub-basin E5 as described in the existing conditions of the preliminary drainage report. This sub-basin is approximately 0.004 acres and

consists of existing landscape located on the northeast corner of the property. Flows developed in this sub-basin generally travel south at grades of approximately 2-5%. Flows are conveyed via an existing drainage swale that flows to the property line at DP OD13A through proposed sub-basin P13 and ultimately into the existing public CDOT Type C area inlet at DP D13. It is understood that these flows are not anticipated to discharge directly into the existing detention basin which is consistent with the existing design and runoff conditions. Developed runoff during the 5-year and 100-year events are less than 0.00 cfs and 0.01 cfs respectively. The weighted imperviousness of proposed sub-basin OP13A is approximately less than 0.1%.

As in the case for proposed sub-basin P13, this sub-basin is not counted towards the proposed exclusion area for disturbed area for the project site given there is no proposed development within this sub-basin. Under existing conditions, this sub-basin conveys stormwater to the existing public area inlet and the intent is to match this historic drainage pattern in proposed conditions.

Design Point 4 (Ref. Existing Conditions Off-site Sub-Basin D16)

Existing Design Point 4 accounts for the existing off-site flows that travel on-site from existing sub-basin D16 as described in the existing conditions and in the preliminary drainage report. It is understood that these flows are generated from the existing Pronghorn Meadows Subdivision (Filing No. 2). The existing flows travel via curb and gutter to an existing Public 8' CDOT Type-R curb inlet and are then conveyed through an existing 24" culvert passing under Antelope Ridge Drive. Flows then generally enter proposed sub-basin P8 at DP 4. Next, these flows are conveyed through the proposed grass drainage swale which ultimately outfalls into the existing public CDOT Type C area inlet. These existing off-site flows do not directly discharge into the existing full spectrum extended detention basin but rather are conveyed along the southern property line and then off-site through existing public stormwater infrastructure. Existing stormwater runoff conveyed to DP 4 during the 5-year and 100-year events are 4.70 cfs and 10.30 cfs respectively.

Sub-Basin OP1

Proposed sub-basin OP1 runs along the western and southern property lines and is generally the existing sub-basin NC2 from the proposed drainage map in the PDR (reference **Appendix**). The overall area is approximately 1.55 acres and consists of existing landscaping, existing paved asphalt, proposed sidewalk, and proposed paved asphalt turn lane. Stormwater runoff generally flows at slopes ranging from approximately 2-5% south via existing and proposed curb and gutter within the Antelope Ridge right-of-way and then east via curb and gutter within the North Carefree Circle right-of-way. Flows then enter and existing public 15' at grade curb inlet at design point OD1. Flows are then conveyed through existing public storm infrastructure off-site south along North Marksheffel Road. It is understood that these flows are not anticipated to discharge directly into the existing detention basin which is consistent with the existing design and runoff conditions. Developed proposed stormwater runoff at design point DP OD1 during the 5-year and 100-year events are 5.22 cfs and 9.96 cfs respectively. The weighted imperviousness of proposed sub-basin OP1 is 87%.

Proposed sub-basin P8A is tributary to proposed sub-basin OP1. Therefore, the cumulative stormwater runoff tributary to design point DP COD1 for the 5-yr and 100-yr storm events are 5.33 cfs and 10.20 cfs respectively.

Exclusion I.7.1.C.1.a

Given the natural constraints imposed by the existing topography of the site and the design considerations of the project, it is not practicable to capture stormwater runoff from this sub-basin. Therefore, per El Paso County Engineering Criteria Manual I.7.1.C.1.a, 0.25 acres of proposed sub-basin OP1 is excluded from the Water Quality Capture Volume given it is not practicable to capture this runoff as it does not drain toward the existing control measure.

Exclusion I.7.1.B.2.1.

Proposed sub-basin OP1 has a total area of disturbance of approximately 0.34 acres. The proposed turn lane on Antelope Ridge Drive is approximately 0.09. Per El Paso County Engineering Criteria Manual I.7.1.B.2.1:

B. Applicable Development Sites: Excluded Sites. The following types of sites and associated land disturbances are excluded from the requirements of this Section 1.7. Although a site may qualify for an exclusion to Section 1.7 below, the site may still be considered an applicable construction activity subject to the requirements of an ESQCP or BESQCP.

2. Excluded Roadway Redevelopment. Redevelopment sites for existing roadways, when 1 of the following criteria is met:

- 1) The site adds less than 1 acre of paved area per mile of roadway to an existing roadway

The proposed turn lane within proposed sub-basin OP1 meets applicable criteria listed above and therefore, 0.09 acres of proposed sub-basin OP1 is an excluded land disturbance. (Reference land disturbance area breakdown table towards end of this report).

Sub-Basin OP2

Proposed sub-basin OP2 is located at the southeast corner of the property at the intersection of North Carefree Circle and North Marksheffel Road and is generally the existing conditions sub-basin NC1 from the proposed drainage map in the PDR (reference **Appendix**). The overall area is approximately 0.43 acres. 0.41 acres is undisturbed and consists of existing landscaping, existing paved asphalt and sidewalk. The remaining 0.02 acres is proposed sidewalk and is excluded per El Paso County Engineering Criteria Manual I.7.1.C.1.a. Stormwater runoff generally flows at slopes ranging from approximately 2-5% southwest via existing and proposed curb and gutter within the North Marksheffel and North Carefree Circle right-of-way. Flows then enter an existing public 10' sump condition curb inlet at design point OD2. Flows are then conveyed through existing public storm infrastructure off-site south along North Marksheffel Road. It is understood that these flows are not anticipated to discharge directly into the existing detention basin which is consistent with the existing design and runoff conditions. Developed proposed stormwater runoff at design point DP OD2 during the 5-year and 100-year events are 1.80 cfs and 3.37 cfs respectively. The weighted imperviousness of proposed sub-basin OP2 is 92%.

Proposed sub-basin P8B is tributary to proposed sub-basin OP2. Flows from sub-basin P8B sheet flow overland into existing curb and enter sub-basin OP2 where flows then enter an existing public 10' sump condition curb inlet within the median of N Carefree Circle. Therefore, the cumulative stormwater runoff tributary to design point COD2 for the 5-yr and 100-yr storm events are 1.86 cfs and 3.48 cfs respectively.

Exclusion I.7.1.C.1.a

Given the natural constraints imposed by the existing topography of the site and the design considerations of the project, it is not practicable to capture stormwater runoff from this sub-basin. Therefore, per El Paso County Engineering Criteria Manual I.7.1.C.1.a, 0.02 acres of proposed sub-basin OP2 is excluded from the Water Quality Capture Volume given it is not practicable to capture this runoff as it does not drain toward the existing control measure.

DRAINAGE FACILITY DESIGN

DETENTION AND WATER QUALITY

The WQCV and 100-year detention is required for this Project. This is accomplished through the existing private Full Spectrum Extended Detention Basin on the east end of the Site. The existing private above ground Full Spectrum Extended Detention Basin was sized to provide WQ and detention for the Windermere Filing No. 2 sub-basin's tributary to the EDB (Existing Sub-Basins from the Preliminary Drainage Report and proposed Sub-Basins P1-P10, OP2) per UDFCD criteria and proposed conditions conform to previous design intent. The water quality and detention calculations are provided in the Preliminary Drainage Report in the Appendix of this report. The existing EDB outfalls into existing public off-site stormwater infrastructure.

Four-Step Process

The four-step process per the MANUAL provides guidance and requirements for the selection of siting of structural Construction Control Measures (CCMs) for new development and significant redevelopment.

Step 1: Employ Runoff Reduction Practices

Currently the site is vacant land that was over lot graded. It was also seeded and mulched and surrounded by existing residential developments. Development of the site will increase current runoff conditions due to increased imperviousness values. However, the detention basin was sized accordingly with an assumed future imperviousness of 68% (Reference PDR by D&B, August 2024). The proposed developed imperviousness tributary to the existing detention facility is approximately 59%. Furthermore, the implementation of landscaping throughout the site, the proposed storm sewer infrastructure, and the existing Full Spectrum Extended Detention Basin will help slow runoff, promote infiltration, and increase time of concentration prior to being released into the existing stormwater system. This aims to minimize directly connected impervious areas within the project site.

Step 2: Provide Water Quality Capture Volume (WQCV)

The water quality capture volume is detained using the existing Full Spectrum Extended Detention Basin at the east end of the Site. The outfall pipe together with the water quality outlet structure control the release of stormwater to less than historic rates.

Per El Paso County Engineering Criteria Manual I.7.1.C.1.a, 100% of the applicable development site is captured, except the County may exclude up to 20 percent, not to exceed 1-acre, of the applicable development site area when the County has determined that it is not practicable to capture runoff from portions of the site that will not drain towards

control measures. In addition, the County must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to street).

Per El Paso County Engineering Criteria Manual I.7.1.B.2.1.

B. Applicable Development Sites: Excluded Sites. The following types of sites and associated land disturbances are excluded from the requirements of this Section 1.7. Although a site may qualify for an exclusion to Section 1.7 below, the site may still be considered an applicable construction activity subject to the requirements of an ESQCP or BESQCP.

2. Excluded Roadway Redevelopment. Redevelopment sites for existing roadways, when 1 of the following criteria is met:

- 1) The site adds less than 1 acre of paved area per mile of roadway to an existing roadway

The total area of disturbance for the project site is ±8.07 acres. Given the above criteria, the following table outlines all applicable exclusion areas for the project site.

Condition	Total Area (acres)	Percentage of Total Disturbed Area (%)	Associated Disturbed Sub-Basins
Areas Captured and Treated with Existing Private Full Spectrum Extended Detention Basin	7.02	86.9%	P1, P2, P3, P4, P5, P6, P7, P9, P10, OP10A, P11, P12
Disturbed Areas that will NOT drain towards the control measure ¹	0.96 ¹	11.9% ¹	P8 (0.61 ac - partial), P8A (0.05 ac - entire), P8B (0.02 ac - entire), OP8A (0.01 ac - entire), OP1 (0.25 ac - partial), OP2 (0.02 ac - partial)
Proposed Turn Lane area of disturbance ²	0.09 ²	1.1% ²	OP1 (0.09 ac - partial)
TOTAL LIMITS OF DISTURBANCE	8.07		

¹May exclude up to 20%, not to exceed 1-acre per El Paso County Engineering Criteria Manual I.7.1.C.1.a

²The site adds less than 1 acre of paved area per mile of roadway to an existing roadway (Proposed turn lane on Antelope Ridge Dr.)

Step 3: Stabilize Drainageways

There are no current drainageways conveyed through this property. No improvements to stabilize drainageways are a part of this Project. Furthermore, flows from the existing detention facility are released directly into the existing stormwater conveyance sewer system. No stabilization will be necessary.

Step 4: Consider need for Industrial and Commercial BMPs

Erosion control features for the final stages of the Project will be designed to reduce contamination. Source control BMPs will include the use of, inlet protection, silt fences, concrete washout areas, stockpile management, and stabilized staging areas. The Grading and Erosion Control Plans will be submitted as a separate construction document set.

Detention and Water Quality Design

As part of the overlot design for Windermere Filing No. 1, the full spectrum extended detention basin located in the southeast corner of the property was designed as a full-spectrum detention facility to capture flows from the Windermere Filing No. 2 basins.

The existing private on-site Full Spectrum Extended Detention Basin was designed with an outlet structure that is fitted with an interim orifice plate and restrictor plate to release the WQCV in a 40-hour time period per the MANUAL. Final orifice plate to be used when proposed development has been fully constructed.

Calculations included in the **Appendix** provide details regarding the private water quality and detention basins design. The calculations include determination of the storage volumes required for full spectrum detention for the WQCV and 100 year detention and allowable release rates.

Per the Windermere Filing No. 2 South Pond Final Design Developed Condition Calculations. Overall, 0.228 acre-feet of WQCV is required, and 0.438 acre-feet of detention volume was required for the existing Extended Detention Basin. The total anticipated area contributing to the Extended Detention Basin consisted of 11.74 acres (59 % imperviousness). The outlet structure and orifice releases approximately 0.9 cfs in the 5-year event and 9.2 cfs in the 100-year event.

Historically, the project falls within an existing sub-basin basin (EX-A) which discharged approximately 11.3 cfs and 28.2 cfs for the 5-year and 100-year events respectively. These flows entered the existing public type D area inlet southeast of the site (Design Point 6). This is the same location that the pond outfall pipe connects and discharges to from the existing stormwater facility control structure. Please reference the historic drainage map by Classic Consulting 09/01/2014 in the Preliminary Drainage Report.

Outlet Requirements

The water quality standards established by the CRITERIA are met by the existing private on-site Full Spectrum Extended Detention Basin. The water quality outlet structure was designed per the specifications in the CRITERIA. The outlet structure for the Extended Detention Basin meets the micro-pool requirement that it be integrated into the design of the structure with an additional initial surcharge volume. The orifice plates of the structures were designed based on the CRITERIA. The orifice plates will allow the WQCV to be drained from the structure in 40 hours for the Extended Detention Basin. The calculations for the design of the outlet structure is presented in the **Appendix**.

Channel Design and Soil Erodibility

An existing concrete lined trickle channel within the basin was designed per the MANUAL. A forebay structure is located at the upstream entrances to the Extended Detention Basin. The forebay structure was designed per the MANUAL. Pond as-builts are included in the **Appendix**.

The proposed stormwater runoff for the site under proposed conditions are not anticipated to cause any adverse impacts in terms of erosion to existing downstream drainage ways or negative impacts to existing stormwater infrastructure. Additionally, the existing full spectrum extended detention basin was designed as part of an anticipated full build-out watershed imperviousness of 68% to accommodate future developments.

The developed stormwater discharges from the detention facilities outlet control structure into the existing stormwater conveyance sewer system and is therefore, not anticipated to adversely affect soil erosion potential.

Developed stormwater runoff will utilize proposed curb and gutter along with proposed stormwater infrastructure to convey flows to the existing stormwater facility.

Emergency Spillway Path

The emergency overflow from the existing private on-site Full Spectrum Extended Detention Basin was designed to follow historic drainage patterns and spill over the southeast side of the Extended Detention Basin to the existing public CDOT Type C area inlet into existing public stormwater infrastructure.

COST OF PROPOSED DRAINAGE INFRASTRUCTURE

An Engineers Opinion of Probable Construction Cost (EOPCC) is provided in this submittal package. There are no public drainage facilities. All improvements with this Project will be private. The improvements are detailed in the Financial Assurance Estimate Form.

DRAINAGE AND BRIDGE FEES

The Site is located in the Sand Creek Drainage Basin. The total acreage of the parcel (PID: 5329416011) is approximately ±9.13 acres. The proposed overall site imperviousness is 57%. The total drainage fees due for the Site is outlined below.

	2024 Fees (\$ / Impervious acre)	Total Site Area (Acre)	X	Site Imperviousness	=	Impervious Area (Acre)	Amount Due (\$)
Drainage Fee	\$25,632.00	9.13		0.57		5.20	\$133,391.49
Bridge Fee	\$10,484.00	9.13		0.57		5.20	\$54,559.78

Total amount due: \$187,951.27

GRADING AND EROSION CONTROL

The GEC plans will be submitted to El Paso County Planning and Community Development Department for review and approval prior to construction. The GEC plans are consistent with this drainage report.

MAINTENANCE AND OPERATIONS

Twice per year inspections (spring and fall) of the stormwater detention and water quality structures are recommended. The owner/operator will be responsible for maintenance. A copy of this report will be provided to the owner/operator. This satisfies the EDB Operation and Maintenance (O&M) Manual.

Ownership and maintenance of all public facilities, generally located within the public right-of-way, will be by El Paso County. Ownership and maintenance of all tracts and private facilities will be by the Sands Metropolitan District #4.

OTHER GOVERNMENT AGENCY REQUIREMENTS

Approval from other agencies such as the FEMA, the Army Corps of Engineers, Colorado State Engineer, Colorado Water Conservation Board, and others are not needed with this Project.

SUMMARY

Ultimate outflow from the site occurs at the southeastern corner of the existing private on-site full spectrum extended detention basin. Existing and proposed flows enter the detention basin and are released at less than historic rates from the existing pond control structure through the existing 18" outfall pipe which connects to the existing public area inlet at the southeast corner of the site. Flows then enter the existing off-site stormwater network at the intersection of N Carefree Circle and N Marksheffel Rd. This existing stormwater network appear to continue to flow south with the N Marksheffel right-of-way per the survey for the site. The SpringsView mapping system is not updated to show existing stormwater infrastructure in the area so the ultimate outfall for the existing system is unknown. However, the closest waterway or tributary to the site is the Sand Creek East Fork tributary.

Per the preliminary drainage report, the existing detention basin design was based on a final build-out watershed imperviousness of 68%. The proposed developed imperviousness tributary to the existing detention facility is approximately 59%.

Per the preliminary drainage report by D&B, August 2024, In accordance with El Paso County criteria, the modified Type C outlet structure with a permanent micropool will release the WQCV over a 40-hour period. Switching out of the orifice plate will ensure that the WQCV release rate remains within criteria for the final developed condition. The outlet structure will remain in place and in this preliminary stage will result in release rates of $Q_5=0.9$ cfs and $Q_{100}=9.2$ cfs. For comparison, the existing basin EX-A released flow rates of $Q_5=11.3$ cfs and $Q_{100}=28.2$ cfs.

The total area tributary to the existing detention facility is approximately ± 11.86 acres and the proposed flows for the sub-basin's tributary to the existing detention facility is 21.13 cfs and 58.33 cfs for the 5-year and 100-year storm events respectively. The overall proposed weighted imperviousness for the site tributary to the existing detention facility is 61%. These proposed flows and overall weighted imperviousness were accounted for the in the original design of the existing detention basin per the preliminary drainage report by D&B, August 2024.

Existing (PDR)	Area (acres)	5-year / 100-year	Proposed (FDR Filing No. 2)	Area (acres)	5-year / 100-year
Sub-Basin OS1, E1 (DP 1)	3.85	7.2 cfs / 15.8 cfs	Sub-Basin OS1, E1, (DP 1)	3.85	7.2 cfs / 15.8 cfs
Sub-Basin OS2	0.16	0.3 cfs / 0.6 cfs	Sub-Basin OS2 (DP 2)	0.16	0.3 cfs / 0.6 cfs
Sub-Basin B2 (DP 2)	6.63	11.8 cfs / 26.0 cfs	Sub-Basins P1, P2, P3, P4, P5, P6, P7, P9, P10, P11, P12, OP10A	7.85	18.63 cfs / 41.93 cfs
Sub-Basin E3 (DP 3)	1.10	0.8 cfs / 4.5 cfs	Sub-Basin P9 (DP D9)	1.16	0.25 cfs / 3.01 cfs

The above table gives a depiction of how the proposed sub-basins compare with the existing sub-basins from the PDR by Drexel, Barrell, & Co.

Existing (FDR Filing No. 1 - Historic Conditions)	5-year / 100-year	Proposed (FDR Filing No. 2)	5-year / 100-year
Design Point 6 (Existing Public Type D Area Inlet)	18.4 cfs / 42.6 cfs	Cumulative Design Point A (Tributary Sub-Basins D16, P8, OP8A, P13, OP13A, EXR)	7.21 cfs / 17.90 cfs

The table shown above depicts the comparison of design points at the existing public type D area inlet. The existing design point data was taken from the existing conditions drainage map by Classic Consulting Engineers and Surveyors (September 1, 2014) as part of the Final Drainage Report for Windermere Filing No. 1.

As a result of the proposed development to include the application of the existing detention basin, there is a decrease in total design flows tributary to the existing area inlet.

Existing Tributary Area (PDR)	Imperviousness (%)	Proposed Tributary Area (FDR Filing No. 2)	Imperviousness (%)
Sub-Basins OS1, OS2,	59% (Composite)	Sub-Basins P1, P2, P3,	61%

E1, B2, E3 (11.74 acres)		P4, P5, P6, P7, P9, P10, OP10A, P11, P12, 1X (11.86 acres)	
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From the above table, the proposed tributary area is greater than the existing planned tributary area given proposed off-site sub-basin OP10A will be captured into the proposed area inlet within proposed sub-basin P10. Also, it is understood that the overall existing composite imperviousness was calculated at 59% and the proposed weighted imperviousness is more at 61%. Additionally, the designed volume for the existing detention facility was assumed to be a final build out of 68% watershed imperviousness. Therefore, the proposed conditions fall within the planned imperviousness for future development. (Please reference this information in further detail within the PDR located in the appendix)

COMPLIANCE WITH STANDARDS

The existing drainage design presented within this report conforms to the El Paso County Drainage Criteria Manual and the Mile High Flood District Urban Storm Drainage Criteria Manual. Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments. The proposed developed flows entering the Extended Detention Basin and are greater than the existing ultimate outfall of the site due to the greater imperviousness of the site. However, the EDB design accounted for future development with associated higher imperviousness and implementation of the drainage basins will disperse the flow over an extended period of time therefore releasing at equal to or less than the historic rate.

The existing drainage system, as outlined in the Preliminary Drainage Report (PDR), consists of four primary sub-basins: OS1/E1 (DP1), OS2, B2 (DP2), and E3 (DP3). These sub-basins collectively manage a total area of approximately 11.74 acres, with flow rates ranging from 0.3 to 26.0 cubic feet per second (cfs) for 5-year and 100-year storm events. The largest contributor in the existing system is Sub-Basin B2, which alone handles 6.63 acres and peak flows of up to 26.0 cfs.

In contrast, the proposed system under Final Drainage Report (FDR) Filing No. 2 retains the OS1/E1 and OS2 sub-basins with no changes in area or flow rates. However, it introduces a significantly expanded drainage layout through the consolidation of multiple new sub-basins (P1 through P12 and OP10A), covering a combined area of 18.55 acres. This new configuration is designed to handle substantially higher flow rates of 26.13 cfs for 5-year events and 58.33 cfs for 100-year events. Additionally, a separate sub-basin, P9 (DP D9), is defined with an area of 1.16 acres and flow rates of 0.25 cfs and 3.01 cfs for the respective storm events.

The proposed system represents a considerable increase in both the total drainage area and the capacity to manage stormwater runoff. This is particularly notable when compared to the historic condition at the existing public Type D area inlet, which previously managed a 5-year peak flow of 18.4 cfs. The proposed inlet will manage a 5-year peak flow of 7.21 cfs.

Additionally, multiple swales were added to the site to assist in the re-routing of storm run-off. These were added near areas of impervious surfaces and adjacent to structures control flow and direction. For additional discussion into the proposed swales, please see Appendix D.

REFERENCES

1. City of Colorado Springs Drainage Criteria Manual, May 2014.
2. El Paso County Drainage Criteria Manual, Vol. 1 and 2, October 1994.
3. Mile High Flood District Drainage Criteria Manual (MHFDCM), Vol. 1, prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.
4. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0543G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).

APPENDIX

APPENDIX A - SOILS MAP AND FEMA FIRM PANEL



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **El Paso County Area, Colorado**



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

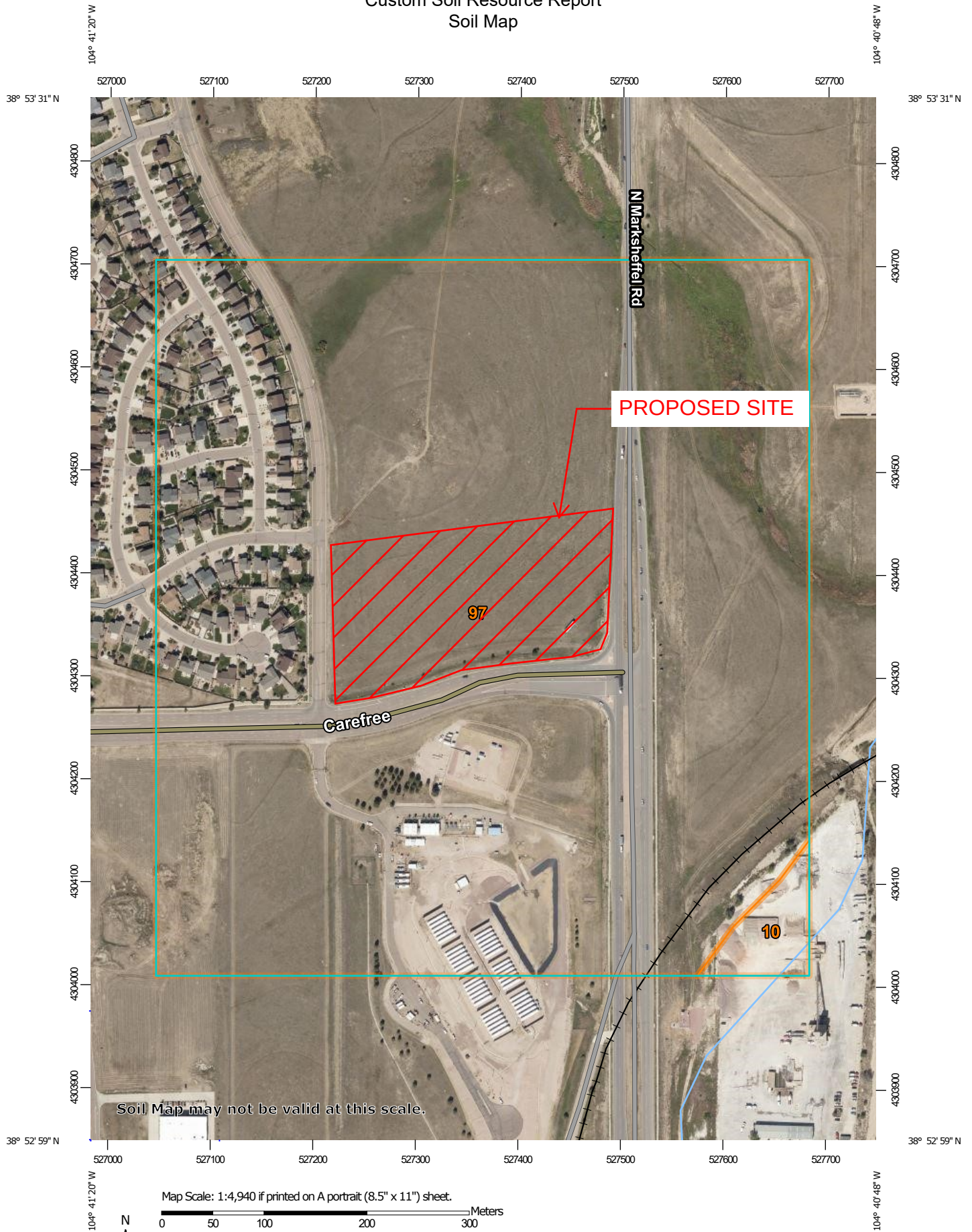
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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



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MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Blendon sandy loam, 0 to 3 percent slopes	1.8	1.6%
97	Truckton sandy loam, 3 to 9 percent slopes	108.1	98.4%
Totals for Area of Interest		109.9	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

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onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

10—Blendon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3671
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blendon and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blendon

Setting

Landform: Terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 10 inches: sandy loam
Bw - 10 to 36 inches: sandy loam
C - 36 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

97—Truckton sandy loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2x0j2

Elevation: 5,300 to 6,850 feet

Mean annual precipitation: 14 to 19 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 85 to 155 days

Farmland classification: Not prime farmland

Map Unit Composition

Truckton and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Interfluves, hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Re-worked alluvium derived from arkose

Typical profile

A - 0 to 4 inches: sandy loam

Bt1 - 4 to 12 inches: sandy loam

Bt2 - 12 to 19 inches: sandy loam

C - 19 to 80 inches: sandy loam

Properties and qualities

Slope: 3 to 9 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 1 percent

Maximum salinity: Nonsaline (0.1 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Blakeland

Percent of map unit: 8 percent
Landform: Interfluves, hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Bresser

Percent of map unit: 7 percent
Landform: Interfluves, low hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

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NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NIMS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov/>.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

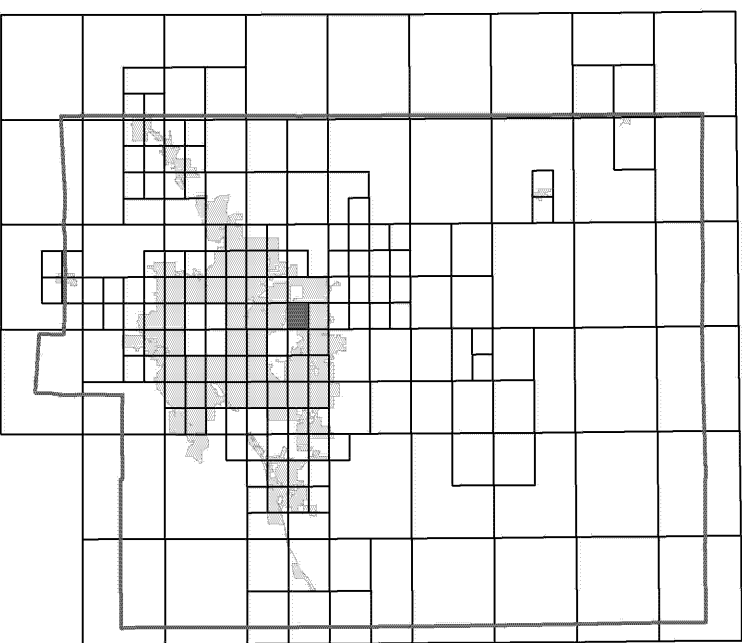
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FIMX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfp>.

El Paso County Vertical Datum Offset Table	
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

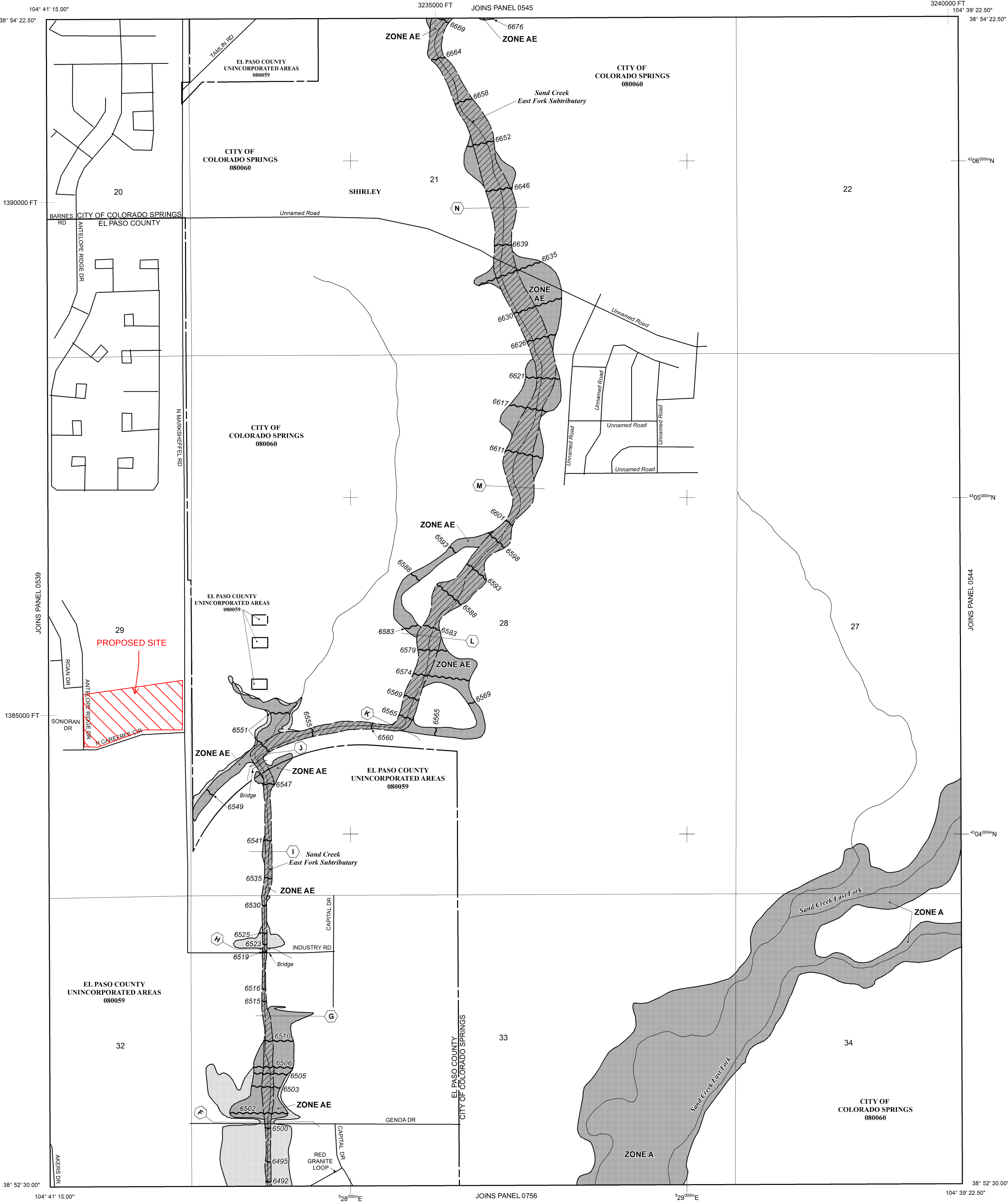
Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).



Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 65 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and value; elevation in feet* (EL 987)
Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

Cross section line

Transect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

1000-meter Universal Transverse Mercator grid ticks, zone 13

5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

River Mile

MAP REPOSITORIES

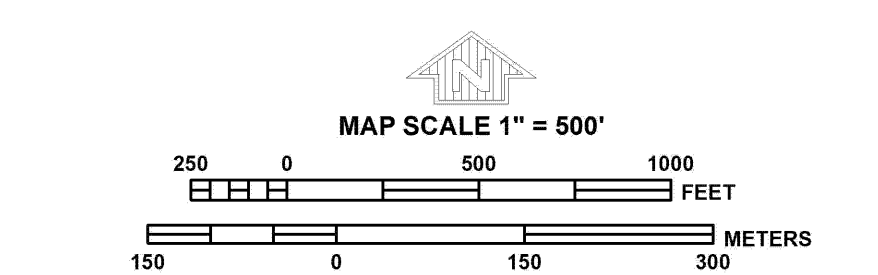
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



PANEL 0543G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 543 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0543	G
EL PASO COUNTY	080059	0543	G

Notice: This map was reissued on 05/15/2020 to make a correction. This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

Notice to User: The **Map Number** shown below should be used when placing map orders. The **Community Number** shown above should be used on insurance applications for the subject community.



MAP NUMBER
08041C0543G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

APPENDIX B - HYDROLOGIC CALCULATIONS

PROJECT INFORMATION									
PROJECT:	Windermere 2								
PROJECT NO:	21187-03								
DESIGN BY:	CGH								
REV. BY:	KGV								
AGENCY:	El Paso County								
REPORT TYPE:	Final								
DATE:	9/5/2024								
Soil Type: A									
					C2*	C5*	C10*	C100*	% IMPERV
Open Space						0.15		0.50	0
Residential (<1/8 acre)						0.45		0.59	65
Asphalt/Sidewalk						0.90		0.96	100
DEVELOPED									
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS						% IMPERV
		ACRE	C2	C5	C10	C100			
OS1	Open Space	0.00		0.15		0.50		0	
	Residential (<1/8 acre)	3.82		0.45		0.59		65	
	Asphalt/Sidewalk	0.00		0.90		0.96		100	
	WEIGHTED AVERAGE			0.45		0.59		65%	
TOTAL OS1		3.82							
OS2	Open Space	0.00		0.15		0.50		0	
	Residential (<1/8 acre)	0.16		0.45		0.59		65	
	Asphalt/Sidewalk	0.00		0.90		0.96		100	
	WEIGHTED AVERAGE			0.45		0.59		65%	
TOTAL OS2		0.16							
E1	Open Space	0.00		0.15		0.50		0	
	Residential (<1/8 acre)	0.00		0.45		0.59		65	
	Asphalt/Sidewalk	0.03		0.90		0.96		100	
	WEIGHTED AVERAGE			0.90		0.96		100%	
TOTAL E1		0.03							
B2	Open Space	0.00		0.15		0.50		0	
	Residential (<1/8 acre)	6.63		0.45		0.59		65	
	Asphalt/Sidewalk	0.00		0.90		0.96		100	
	WEIGHTED AVERAGE			0.45		0.59		65%	
TOTAL B2		6.63							
E3	Open Space	1.10		0.15		0.50		0	
	Residential (<1/8 acre)	0.00		0.45		0.59		65	
	Asphalt/Sidewalk	0.00		0.90		0.96		100	
	WEIGHTED AVERAGE			0.15		0.50		0%	
TOTAL E3		1.10							
B4	Open Space	0.68		0.15		0.50		0	
	Residential (<1/8 acre)	0.00		0.45		0.59		65	
	Asphalt/Sidewalk	0.25		0.90		0.96		100	
	WEIGHTED AVERAGE			0.35		0.62		27%	
TOTAL B4		0.93							
E5	Open Space	0.63		0.15		0.50		0	
	Residential (<1/8 acre)	0.00		0.45		0.59		65	
	Asphalt/Sidewalk	0.00		0.90		0.96		100	
	WEIGHTED AVERAGE			0.15		0.50		0%	
TOTAL E5		0.63							
NC2	Open Space	0.27		0.15		0.50		0	
	Residential (<1/8 acre)	0.00		0.45		0.59		65	

EXISTING HYDROLOGIC CALCULATIONS FROM PDR by D&B, August 2024

	Asphalt/Sidewalk	1.34		0.90		0.96	100
	WEIGHTED AVERAGE			0.77		0.88	83%
TOTAL NC2		1.61					
NC1	Open Space	0.03		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.40		0.90		0.96	100
	WEIGHTED AVERAGE			0.85		0.93	93%
TOTAL NC1		0.43					
D16	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	2.73		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL D16		2.73					
EXR	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.53		0.90		0.96	100
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL EXR		0.53					
Pond Tributary (OS1, OS2, E1, B2, E3)		11.74		0.42		0.58	59%

EXISTING HYDROLOGIC CALCULATIONS FROM PDR by D&B, August 2024

PROJECT INFORMATION

PROJECT: Windermere 2
 PROJECT NO: 21187-03
 DESIGN BY: CGH
 REV. BY: KGV
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/5/2024



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t _i)					TRAVEL TIME (t _t)					PIPE TRAVEL TIME (t _p)				TIME OF CONC. t _c		FINAL t _c
BASIN	DESIGN PT:	C _s	C ₁₀₀	AREA		LENGTH	HT	SLOPE	t _i	LENGTH	HT	SLOPE	VEL.	t _t	LENGTH	SLOPE	VEL.	t _p	COMP.	MINIMUM	
				Ac		Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t _c	t _c	Min
OS1		0.45	0.59	3.82	1.72	2.25	35	1	3.5	4.7	885	30	3.4	2.8	5.3				10.1	5	10.1
OS2		0.45	0.59	0.16	0.07	0.10	50	2	4.0	5.4	725	20	2.8	2.5	4.8				10.2	5	10.2
E1		0.90	0.96	0.03	0.03	0.03	20	0	2.0	1.3					30	2.0	8.3	0.1	1.4	5	5.0
OS1+E1	1	0.45	0.59	3.85	1.75	2.29	From OS1			10.1					30	2.0	8.3	0.1	10.1	5	10.1
B2	2	0.45	0.59	6.63	2.98	3.91	100	5	5.3	7.0	650	21	3.2	2.7	4.0				11.0	5	11.0
E3		0.15	0.50	1.10	0.16	0.55	85	24	28.5	5.4	75	4	5.3	3.5	0.4				5.7	5	5.7
DP1+DP2+OS2+E3	3	0.42	0.58	11.74	4.97	6.84	From DP2			11.0	75	4	5.3	3.5	0.4				11.4	5	11.4
D16	4	0.45	0.59	2.73	1.23	1.61	200	10	5.0	10.1	350	12	3.5	2.8	2.1				12.1	5	12.1
B4		0.35	0.62	0.93	0.33	0.58	100	5	5.5	7.9	830	18	2.2	2.2	6.3				14.2	5	14.2
DP4+E4	4A	0.43	0.60	3.66	1.55	2.19	From DP4			12.1	775	18	2.3	2.3	5.7				17.8	5	17.8
E5	5	0.15	0.50	0.63	0.09	0.32	60	12	20.0	5.1	455	15	3.3	2.7	2.8				7.9	5	7.9
EXR		0.90	0.96	0.53	0.48	0.51	20	2	10.0	0.8	320	6	2.0	2.1	2.5				3.3	5	5.0
DP4A+DP5+EXR	S	0.44	0.63	4.82	2.13	3.01	From DP4A			17.8	20	0.2	1.0	1.5	0.2				18.0	5	18.0
NC2	19	0.77	0.88	1.61	1.25	1.42					625	25	4.0	3.0	3.5				3.5	5	5.0
DPS+DP19	J1	0.52	0.69	6.43	3.37	4.44	From DPS			18.0					30	2	9.6	0.1	18.1	5	18.1
NC1		0.85	0.93	0.43	0.36	0.40	45	1	2.2	2.4	185	4	2.2	2.2	1.4				3.8	5	5.0
DPJ1+NC1	20	0.54	0.70	6.86	3.74	4.83	From DPJ1			18.1					45	2	9.6	0.1	18.1	5	18.1

EXISTING HYDROLOGIC CALCULATIONS FROM PDR by D&B, August 2024

PROJECT INFORMATION

PROJECT: Windermere 2
 PROJECT NO: 21187-03
 DESIGN BY: CGH
 REV. BY: KGV
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/5/2024



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED	RUNOFF		5 YR STORM		P1=		1.50
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1		3.82	0.45	10.1	1.72	4.09	7.0
OS2		0.16	0.45	10.2	0.07	4.06	0.3
E1		0.03	0.90	5.0	0.03	5.10	0.2
	1	3.85	0.45	10.1	1.75	4.08	7.1
B2	2	6.63	0.45	11.0	2.98	3.95	11.8
E3		1.10	0.15	5.7	0.16	4.92	0.8
	3	11.74	0.42	11.4	4.97	3.90	19.4
Pond Outfall							0.9
D16	4	2.73	0.45	12.1	1.23	3.80	4.7
B4		0.93	0.35	14.2	0.33	3.55	1.2
	4A	3.66	0.43	17.8	1.55	3.20	5.0
E5	5	0.63	0.15	7.9	0.09	4.47	0.4
EXR		0.53	0.90	5.0	0.48	5.10	2.4
	S	4.82	0.44	18.0	2.13	3.18	7.7
NC2	19	1.61	0.77	5.0	1.25	5.10	6.4
	J1	6.43	0.52	18.1	3.37	3.17	10.7
NC1		0.43	0.85	5.0	0.36	5.10	1.9
	20	6.86	0.54	18.1	3.74	3.16	11.8

EXISTING HYDROLOGIC CALCULATIONS FROM PDR by D&B, August 2024

PROJECT INFORMATION

PROJECT: Windermere 2
 PROJECT NO: 21187-03
 DESIGN BY: CGH
 REV. BY: KGV
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/5/2024



Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED	RUNOFF 100 YR STORM				P1= 2.52		
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1		3.82	0.59	10.1	2.25	6.87	15.5
OS2		0.16	0.59	10.2	0.10	6.83	0.6
E1		0.03	0.96	5.0	0.03	8.58	0.3
	1	3.85	0.59	10.1	2.29	6.86	15.7
B2	2	6.63	0.59	11.0	3.91	6.64	26.0
E3		1.10	0.50	5.7	0.55	8.27	4.5
	3	11.74	0.58	11.4	6.84	6.56	44.8
Pond Outfall							9.2
D16	4	2.73	0.59	12.1	1.61	6.38	10.3
B4		0.93	0.62	14.2	0.58	5.96	3.4
	4A	3.66	0.60	17.8	2.19	5.37	11.7
E5	5	0.63	0.50	7.9	0.32	7.51	2.4
EXR		0.53	0.96	5.0	0.51	8.58	4.4
	S	4.82	0.63	18.0	3.01	5.34	25.3
NC2	19	1.61	0.88	5.0	1.42	8.58	12.2
	J1	6.43	0.69	18.1	4.44	5.33	23.6
NC1		0.43	0.93	5.0	0.40	8.58	3.4
	20	6.86	0.70	18.1	4.83	5.32	25.7

STANDARD FORM SF-1
PROPOSED RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION

PROJECT NAME: Windermere Filing No. 2
PROJECT NUMBER: 196160000
CALCULATED BY: DPM
CHECKED BY: NMB

DATE: 5/21/2025

SOIL: Type A

LAND USE:		PAVEMENT AREA	ROOF AREA	LANDSCAPE AREA						
		AREA	AREA	AREA						
2-YEAR COEFF.		0.89	0.71	0.02						
5-YEAR COEFF.		0.90	0.73	0.08						
10-YEAR COEFF.		0.92	0.75	0.15						
100-YEAR COEFF.		0.96	0.81	0.35						
IMPERVIOUS %		100%	90%	0%						
DESIGN BASIN	DESIGN POINT	PAVEMENT AREA (AC)	ROOF AREA (AC)	LANDSCAPE AREA (AC)	TOTAL AREA (AC)	C(2)	C(5)	C(10)	C(100)	Imp %
On-Site Basins										
P1	D1	0.26	0.09	0.16	0.51	0.58	0.61	0.65	0.74	66%
P2	D2	0.15	0.12	0.13	0.40	0.55	0.58	0.61	0.71	64%
P3	D3	0.28	0.40	0.05	0.74	0.73	0.75	0.77	0.84	88%
P4	D4	0.53	0.62	0.24	1.39	0.66	0.68	0.71	0.79	78%
P5	D5	0.05	0.00	0.44	0.49	0.11	0.17	0.23	0.42	11%
P6	D6	0.67	0.88	0.14	1.68	0.73	0.75	0.77	0.83	87%
P7	D7	0.07	0.00	0.23	0.29	0.22	0.27	0.33	0.49	23%
P8	D8	0.00	0.00	0.80	0.80	0.02	0.08	0.15	0.35	0%
P8A	D8A	0.03	0.00	0.02	0.05	0.55	0.58	0.62	0.72	61%
P8B	D8B	0.01	0.00	0.00	0.02	0.71	0.73	0.76	0.83	79%
P9	D9	0.04	0.00	1.12	1.16	0.05	0.11	0.18	0.37	4%
P10	D10	0.06	0.00	0.15	0.20	0.26	0.30	0.36	0.52	27%
P11	D11	0.20	0.12	0.19	0.51	0.53	0.56	0.60	0.70	61%
P12	D12	0.20	0.08	0.14	0.42	0.57	0.60	0.64	0.73	66%
P13	D13	0.00	0.00	0.56	0.56	0.02	0.08	0.15	0.35	0%
Off-Site Basins										
OP1	OD1	1.35	0.00	0.21	1.55	0.77	0.79	0.19	0.88	87%
OP2	OD2	0.40	0.00	0.04	0.43	0.82	0.83	0.03	0.91	92%
Existing	D16	0.00	1.98	0.75	2.73	0.52	0.55	4.48	0.68	65%
1X	OS1+OS2+E1	0.03	2.90	1.08	4.01	0.53	0.56	6.47	0.69	66%
Existing	EXR	0.53	0.00	0.00	0.53	0.89	0.90	0.00	0.96	100%
OP8A	OD8A	0.00	0.00	0.01	0.01	0.02	0.08	0.28	0.35	0%
OP10A	OD10A	0.01	0.00	0.05	0.05	0.14	0.19	0.25	0.43	13%
OP13A	OD13A	0.00	0.00	0.004	0.004	0.02	0.08	0.15	0.35	0%
Imperviousness Tributary to EDB		2.55	5.21	4.10	11.86	0.51	0.54	15.05	0.68	61%
Overall Drainage Area Imperviousness		4.87	7.19	5.93	18.55	0.52	0.54	20.95	0.68	61%
BASIN SUBTOTAL		22%	44%	35%	100%					

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF
DEVELOPED TIME OF CONCENTRATION STANDARD FORM SF-2

FROM THE PRELIMINARY DRAINAGE REPORT FOR WINDERMERE FILING NO. 2 by D&B, August 2024

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t)					TRAVEL TIME (t)					PIPE TRAVEL TIME (t)				TIME OF CONC. t _c		FINAL t _c
BASIN	DESIGN PT.	C _s	C ₁₀₀	AREA	LENGTH	HT	SLOPE	t _c		LENGTH	HT	SLOPE	VEL.	t _c	LENGTH	SLOPE	VEL.	t _c	COMP.	MINIMUM	
				Ac	ft	ft	%	Min		ft	ft	%	FPS	Min	ft	%	FPS	Min	t _c	t _c	Min
OS1		0.45	0.59	3.82	1.72	2.25	35	1	3.5	4.7	885	30	3.4	2.8	5.3				10.1	5	10.1
OS2		0.45	0.59	0.16	0.07	0.10	50	2	4.0	5.4	725	20	2.8	2.5	4.8				10.2	5	10.2
E1		0.90	0.96	0.03	0.03	0.03	20	0	2.0	1.3					30	2.0	8.3	0.1	1.4	5	5.0
OS1+E1	1	0.45	0.59	3.85	1.75	2.29	From OS1			10.1					30	2.0	8.3	0.1	10.1	5	10.1
B2	2	0.45	0.59	6.63	2.98	3.91	100	5	5.3	7.0	650	21	3.2	2.7	4.0				11.0	5	11.0
E3		0.15	0.50	1.10	0.16	0.55	85	24	28.5	5.4	75	4	5.3	3.5	0.4				5.7	5	5.7
DP1+DP2+OS2+E3	3	0.42	0.58	11.74	4.97	6.84	From DP2			11.0	75	4	5.3	3.5	0.4				11.4	5	11.4
D16	4	0.45	0.59	2.73	1.23	1.61	200	10	5.0	10.1	350	12	3.5	2.8	2.1				12.1	5	12.1
B4		0.35	0.62	0.93	0.33	0.58	100	5	5.5	7.9	830	18	2.2	2.2	6.3				14.2	5	14.2
DP4+E4	4A	0.43	0.60	3.66	1.55	2.19	From DP4			12.1	775	18	2.3	2.3	5.7				17.8	5	17.8
E5	5	0.15	0.50	0.63	0.09	0.32	60	12	20.0	5.1	455	15	3.3	2.7	2.8				7.9	5	7.9
EXR		0.90	0.96	0.53	0.48	0.51	20	2	10.0	0.8	320	6	2.0	2.1	2.5				3.3	5	5.0
DP4A+DPS+EXR	S	0.44	0.63	4.82	2.13	3.01	From DP4A			17.8	20	0.2	1.0	1.5	0.2				18.0	5	18.0
NC2	19	0.77	0.88	1.61	1.25	1.42					625	25	4.0	3.0	3.5				3.5	5	5.0
DPS+DP19	J1	0.52	0.69	6.43	3.37	4.44	From DPS			18.0					30	2	9.6	0.1	18.1	5	18.1
NC1		0.85	0.93	0.43	0.36	0.40	45	1	2.2	2.4	185	4	2.2	2.2	1.4				3.8	5	5.0
DPJ1+NC1	20	0.54	0.70	6.86	3.74	4.83	From DPJ1			18.1					45	2	9.6	0.1	18.1	5	18.1

SUB-BASINS OS1, OS2, E1, D16, AND EXR ARE FROM THE PRELIMINARY DRAINAGE REPORT FOR WINDERMERE FILING NO. 2 (BY DREXEL BARRELL). THE HYDROLOGIC CALCULATIONS FOR THESE SUB-BASINS ARE NOT IMPACTED BY THE PROPOSED DEVELOPMENT, THEREFORE THE CALCULATIONS HAVE NOT BEEN MODIFIED AND ARE PROVIDED HERE FOR REFERENCE.



STANDARD FORM SF-2

Proposed Time of Concentration

PROJECT NAME:	Windermere Filing No. 2
PROJECT NUMBER:	196160000
CALCULATED BY:	DPM
CHECKED BY:	NMB

DATE: 5/21/2025

SUB-BASIN DATA			INITIAL TIME (T _i)			TRAVEL TIME (T _i)					T _c CHECK (URBANIZED BASINS)					FINAL T _c
DESIGN BASIN (1)	AREA Ac (2)	C5 (3)	LENGTH Ft (4)	SLOPE % (5)	T _i Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	C _v (9)	VEL fps (11)	T _i Min. (12)	COMP. t _c (13)	TOTAL LENGTH (14)	TOTAL SLOPE (15)	TOTAL IMP. (16)	T _c Min. (17)	Min. (18)
On-Site Basins																
P1	0.513	0.610	87	1.3%	7.7	179	2.0%	20.0	2.8	1.1	8.7	266	1.8%	66%	16.5	8.7
P2	0.396	0.575	74	2.7%	5.9	133	2.3%	20.0	3.0	0.7	6.7	207	2.4%	64%	16.4	6.7
P3	0.736	0.751	72	1.8%	4.5	227	2.3%	20.0	3.0	1.2	5.7	299	2.2%	88%	12.7	5.7
P4	1.390	0.684	66	1.7%	5.2	263	2.5%	20.0	3.2	1.4	6.6	329	2.3%	78%	14.5	6.6
P5	0.491	0.167	91	15.0%	6.6	237	2.0%	15.0	2.1	1.9	8.5	328	5.6%	11%	26.4	8.5
P6	1.681	0.745	65	1.5%	4.6	441	4.4%	20.0	4.2	1.8	6.3	506	4.0%	87%	13.2	6.3
P7	0.295	0.267	61	15.0%	4.8	145	1.0%	15.0	1.5	1.6	6.5	206	5.1%	23%	23.4	6.5
P8	0.803	0.081	75	14.7%	6.6	799	3.7%	15.0	2.9	4.6	11.2	874	4.6%	0%	33.5	11.2
P8A	0.045	0.583	100	3.8%	6.1	182	2.7%	20.0	3.3	0.9	7.0	282	3.1%	61%	17.1	7.0
P8B	0.016	0.727	100	5.3%	3.9	21	0.8%	20.0	1.8	0.2	4.1	121	4.5%	79%	13.1	5.0
P9	1.162	0.109	100	18.0%	6.9	282	1.5%	15.0	1.8	2.6	9.5	382	5.8%	4%	28.2	9.5
P10	0.202	0.303	46	3.1%	6.8	305	2.9%	15.0	2.6	2.0	8.8	351	2.9%	27%	24.0	8.8
P11	0.512	0.562	28	2.2%	4.0	238	4.9%	20.0	4.4	0.9	4.9	266	4.6%	61%	16.7	5.0
P12	0.420	0.602	60	2.2%	5.4	174	4.5%	20.0	4.2	0.7	6.1	234	3.9%	66%	15.9	6.1
P13	0.562	0.080	100	12.0%	8.2	379	5.2%	15.0	3.4	1.8	10.0	479	6.6%		29.4	10.0
Off-Site Basins																
OP1	1.55	0.79	47	1.2%	3.7	1,291	5.2%	20.0	4.6	4.7	8.4	1338	5.1%	87%	15.9	8.4
OP2	0.43	0.83	54	3.9%	2.3	156	2.4%	20.0	3.1	0.8	3.1	210	2.8%	92%	11.4	5.0
Existing	2.73	0.55	Reference Existing Rational Calcs			Reference Existing Rational Calcs										
1X	4.01	0.56														
Existing	0.53	0.90														
OP8A	0.01	0.08	46	3.0%	8.8			7.0			8.8	46	3.0%		26.5	8.8
OP10A	0.05	0.19	100	1.9%	13.5	288	3.1%	15.0	2.6	1.8	15.3	388	2.8%	13%	27.3	15.3
OP13A	0.00	0.08	21	7.0%	4.5			15.0			4.5	21	7.0%		26.1	5.0
$t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_o^{0.33}}$ $t_i = \frac{L_i}{60K\sqrt{S_o}} = \frac{L_i}{60V_i}$ $t_i = (26 - 17i) + \frac{L_i}{60(14i + 9)\sqrt{S_i}}$																



STANDARD FORM SF-3
PROPOSED STORM DRAINAGE DESIGN - RATIONAL METHOD 5 YEAR EVENT

PROJECT NAME: Windermere Filing No. 2
PROJECT NUMBER: 1.96E+08
CALCULATED BY: DPM
CHECKED BY: NMB

DATE: 5/21/2025

P₁ (1-Hour Rainfall) = 1.5

[illegible]

$$I_5 = -1.5 \ln(t_{c,min}) + 7.583$$

Note: Rainfall Intensity from Figure 6-5 IDF Equations



STANDARD FORM SF-3
PROPOSED STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: Windermere Filing No. 2

PROJECT NUMBER: 1.96E+08

CALCULATED BY: DPM

CHECKED BY: NMB

$$P_1 \text{ (1-Hour Rainfall)} = 2.52$$

DATE: 5/21/2025

[illegible]

Kimley»Horn

PROJECT NAME: Windermere Filing No. 2
 PROJECT NUMBER: 196160000
 CALCULATED BY: DPM
 CHECKED BY: NMB

DATE: 1/8/2026

PROPOSED RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	PEAK FLOWS (CFS)	
			Q5	Q100
On-Site Basins				
D1	P1	0.51	1.27	2.72
D2	P2	0.40	1.01	2.22
D3	P3	0.74	2.64	5.07
D4	P4	1.39	4.32	8.66
D5	P5	0.49	0.24	1.48
D6	P6	1.68	5.81	11.19
D7	P7	0.29	0.30	1.15
D8	P8 ^{1,2}	0.80	0.07	1.83
D8A	P8A ^{1,2}	0.05	0.11	0.25
D8B	P8B ^{1,2}	0.02	0.06	0.11
D9	P9	1.16	0.25	3.01
D10	P10	0.20	0.22	0.75
D11	P11	0.51	1.38	3.08
D12	P12	0.42	1.16	2.49
D13	P13 ¹	0.56	0.05	1.34
Tributary TOTAL		7.80	18.61	41.80
On-Site TOTAL		9.22	18.89	45.34
Off-Site Basins				
OD1	OP1 ^{1,2}	1.55	5.22	9.96
OD2	OP2 ^{1,2}	0.43	1.80	3.37
Existing	D16	2.73	4.70	10.30
1X	OS1 + OS2 + E1	4.01	7.50	16.40
Existing	EXR	0.53	2.40	4.40
OD8A	OP8A ^{1,2}	0.01	0.00	0.02
OD10A	OP10A	0.05	0.02	0.13
OD13A	OP13A ¹	0.004	0.00	0.01
Tributary TOTAL		4.06	7.52	16.53
Off-Site TOTAL		9.32	21.65	44.59
Cumulative Design Points				
A	CD8 + CD13+D16+EXR	4.71	7.21	17.90
DP1A	Proposed Tributary Total	7.85	18.63	41.93
DP1B	1A+1X	11.86	26.13	58.33
CD6	P6 + P11 + P12	2.61	8.25	16.53
CD8	P8 + OP8A ^{1,2}	0.81	0.07	1.85
CD10	P10 + OP10A	0.26	0.20	0.72
COD1	OP1+ P8A ^{1,2}	1.60	5.33	10.20
COD2	OP2 + P8B ^{1,2}	0.45	1.86	3.48
CD13	P13 + OP13A ¹	1.17	0.05	1.35
¹ Highlighted Basins are NOT Tributary to Existing Stormwater Facility				
² Disturbed Area to be excluded per El Paso County Engineering Criteria Manual I.7.1.C.1.a (Pr. Disturbed Areas < 1 ac) & I.7.1.B.2.2 (Pr. Turn Lane < 1 ac)				
Tributary TOTAL (DP 1B)		11.86	26.13	58.33
On-Site & Off-Site TOTAL		18.55	40.54	89.93

APPENDIX C - HYDRAULIC CALCULATIONS – STORMCAD & FLOWMASTER

Windemere
5-Year
Conduit Table - Time: 0.00 hours

Start Node	Stop Node	Material	Diameter (in)	Length (User Defined) (ft)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Froude Number (Normal)
MH-N1	MH-N2	Concrete	12.0	79.7	0.013	1.25	6.69	6.94	18.0	6,602.41	6,599.20	2.597
1A	MH-N1	Concrete	12.0	15.8	0.013	1.25	6.69	6.94	18.0	6,603.11	6,602.65	2.598
MH-N2	MH-N3	Concrete	12.0	258.5	0.013	1.25	6.69	6.94	18.0	6,599.29	6,589.30	2.597
1B	2B	Concrete	18.0	84.6	0.013	2.74	5.42	11.74	23.3	6,591.77	6,591.00	1.595
MH-S2	1B	Concrete	12.0	50.2	0.013	0.20	2.49	3.65	5.5	6,592.35	6,591.80	1.324
MH-S1	MH-S2	Concrete	12.0	100.7	0.013	0.20	3.44	5.78	3.5	6,595.10	6,592.39	2.055
AI 1	MH-S1	Concrete	12.0	30.7	0.013	0.20	3.44	5.79	3.5	6,596.01	6,595.15	2.055
2B	MH-S3	Concrete	18.0	11.2	0.013	6.87	6.91	11.76	58.4	6,591.00	6,590.94	1.494
MH-S3	AI 2	Concrete	18.0	120.6	0.013	6.87	9.48	17.94	38.3	6,590.76	6,586.87	2.392
2A	MH-N3	Concrete	12.0	17.6	0.013	0.97	6.49	7.35	13.2	6,590.17	6,589.26	2.743
MH-N3	MH-N4	Concrete	18.0	156.4	0.013	2.22	5.66	13.58	16.4	6,589.07	6,586.31	1.844
AI 2	MH-S4	Concrete	18.0	54.7	0.013	7.11	9.66	18.19	39.1	6,587.16	6,585.61	2.419
MH-S4	MH-S5	Concrete	18.0	204.9	0.013	7.11	9.66	18.19	39.1	6,585.42	6,578.89	2.420
MH-N4	05 (STRM)	Concrete	18.0	91.7	0.013	2.22	9.41	27.76	8.0	6,586.36	6,579.68	3.708
MH-S5	3B	Concrete	24.0	127.3	0.013	7.40	6.45	22.63	32.7	6,578.71	6,577.67	1.482
AI 3	MH-S5	Concrete	12.0	37.0	0.013	0.29	2.14	2.52	11.5	6,579.10	6,579.09	0.937
MH-S6	MH-S7	Concrete	24.0	53.1	0.013	12.96	6.87	20.38	63.6	6,577.41	6,576.84	1.240
MH-S7	34 (STRM)	Concrete	30.0	55.9	0.013	12.96	5.74	30.64	42.3	6,576.39	6,576.04	1.064
3B	MH-S6	Concrete	24.0	15.7	0.013	12.96	7.45	22.63	57.3	6,577.67	6,577.77	1.405

Catch Basin Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Inlet Location	Inlet Type
AI 1	6,598.33	6,595.83	Standard	0.000	0.00	6,596.01	6,596.01	In Sag	Full Capture
1B	6,603.47	6,591.14	Standard	0.000	0.00	6,591.77	6,591.77	In Sag	Full Capture

Windemere

5-Year

Catch Basin Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Inlet Location	Inlet Type
2B	6,600.65	6,589.98	Standard	0.000	0.00	6,591.00	6,591.00	In Sag	Full Capture
AI 2	6,590.09	6,586.13	Standard	0.000	0.00	6,587.16	6,587.16	In Sag	Full Capture
AI 3	6,584.32	6,578.83	Standard	0.000	0.00	6,579.10	6,579.10	In Sag	Full Capture
3B	6,584.20	6,576.37	Standard	0.000	0.00	6,577.67	6,577.67	In Sag	Full Capture
1A	6,605.88	6,602.64	Standard	0.000	0.00	6,603.11	6,603.11	In Sag	Full Capture
2A	6,593.48	6,589.76	Standard	0.000	0.00	6,590.17	6,590.17	In Sag	Full Capture

Manhole Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)
MH-N1	6,606.02	6,601.94	1.25	6,602.65	6,602.41	Standard	1.320	0.24
MH-N2	6,603.50	6,598.82	1.25	6,599.30	6,599.29	Standard	0.050	0.01
MH-S2	6,602.77	6,592.17	0.20	6,592.43	6,592.35	Standard	1.320	0.08
MH-S1	6,602.75	6,594.92	0.20	6,595.15	6,595.10	Standard	0.640	0.04
MH-S3	6,600.79	6,589.74	6.87	6,590.94	6,590.76	Standard	0.400	0.18
MH-N3	6,593.39	6,588.51	2.22	6,589.28	6,589.07	Standard	1.020	0.21
MH-S4	6,592.55	6,584.39	7.11	6,585.61	6,585.42	Standard	0.400	0.19
MH-N4	6,590.41	6,585.80	2.22	6,586.38	6,586.36	Standard	0.100	0.02
MH-S5	6,587.00	6,577.74	7.40	6,579.09	6,578.71	Standard	1.020	0.38
MH-S7	6,584.98	6,575.18	12.96	6,576.69	6,576.39	Standard	0.640	0.30
MH-S6	6,584.44	6,576.11	12.96	6,577.77	6,577.41	Standard	0.640	0.36

Outfall Table - Time: 0.00 hours

Windemere

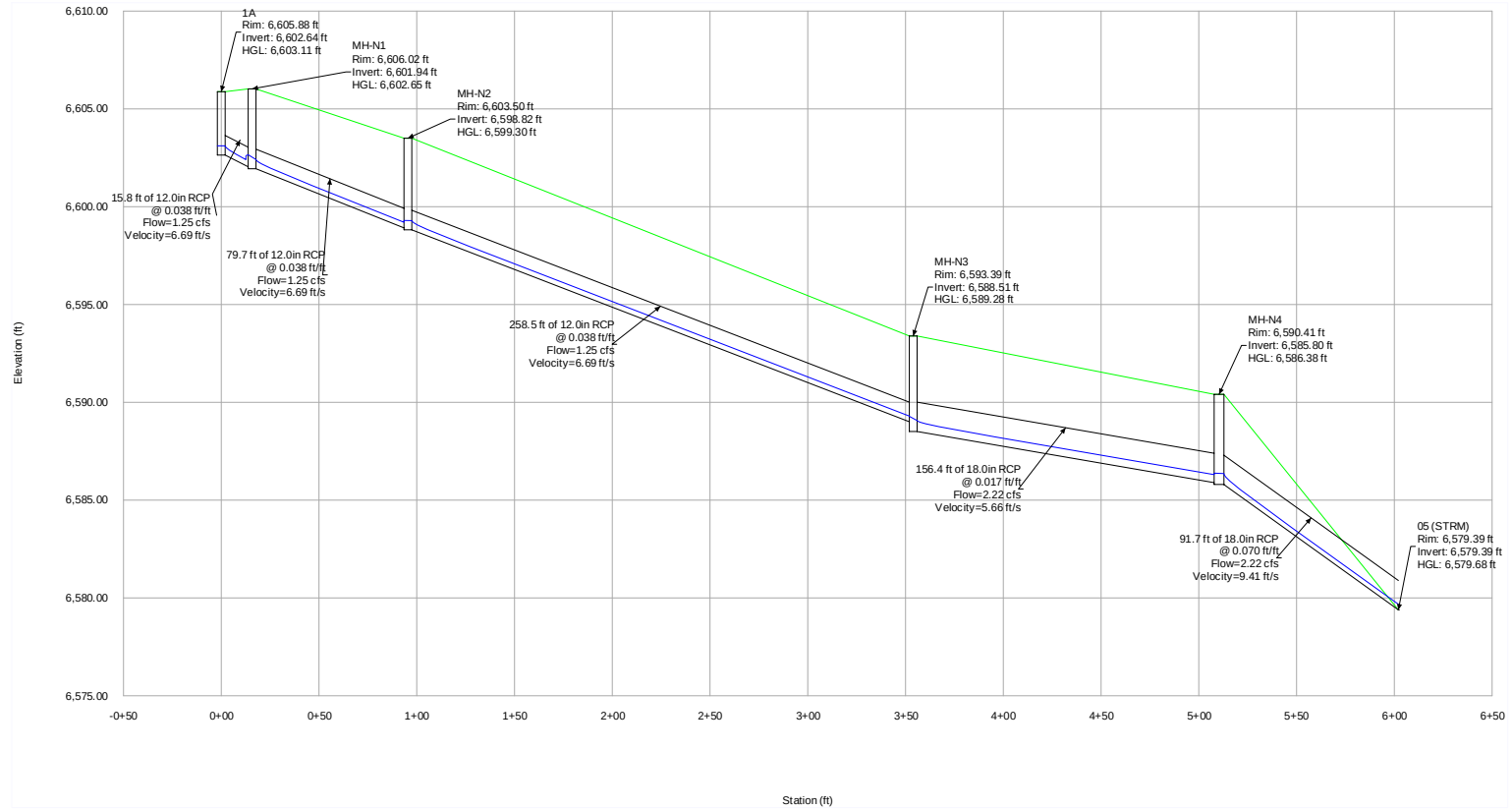
5-Year

Outfall Table - Time: 0.00 hours

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
05 (STRM)	6,579.39	6,579.39	Free Outfall	0.00	6,579.68	2.22
34 (STRM)	6,574.87	6,574.87	Free Outfall	0.00	6,576.04	12.96

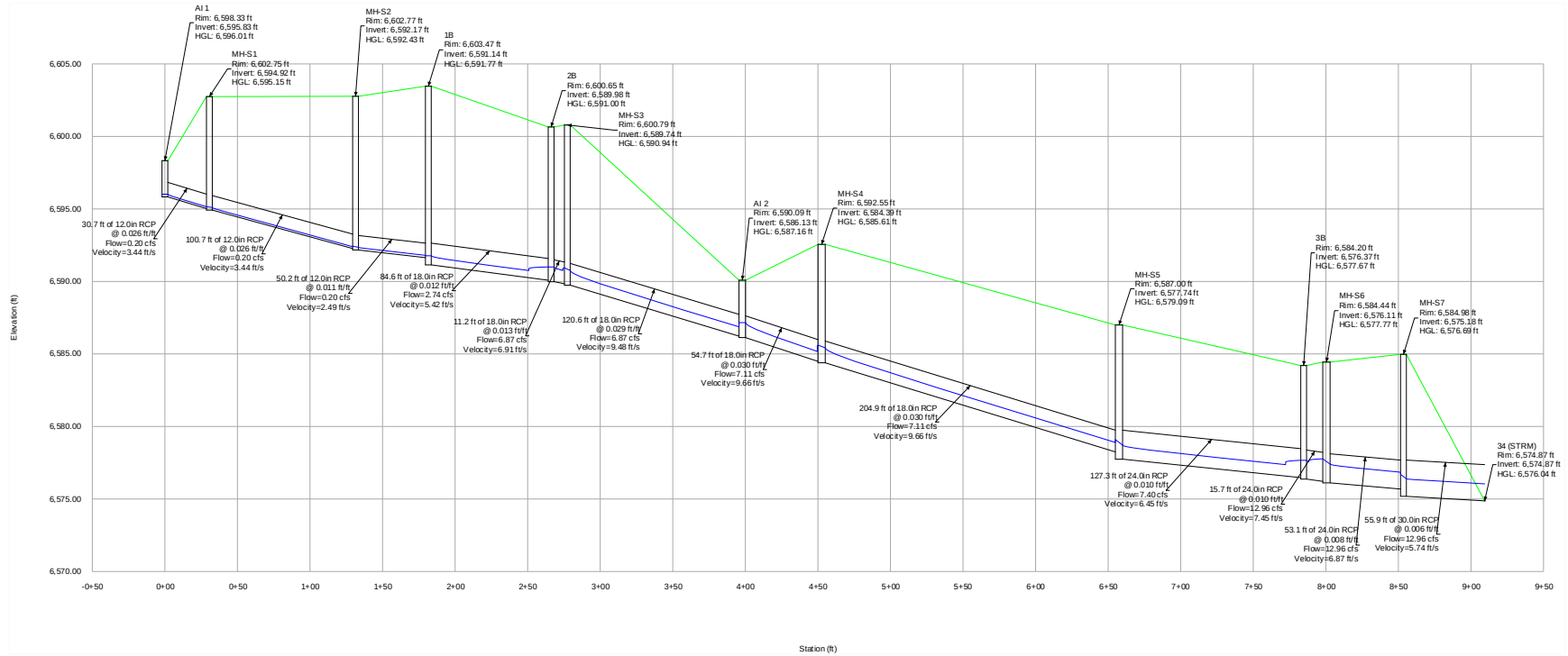
Windemere

5-Year Storm - North



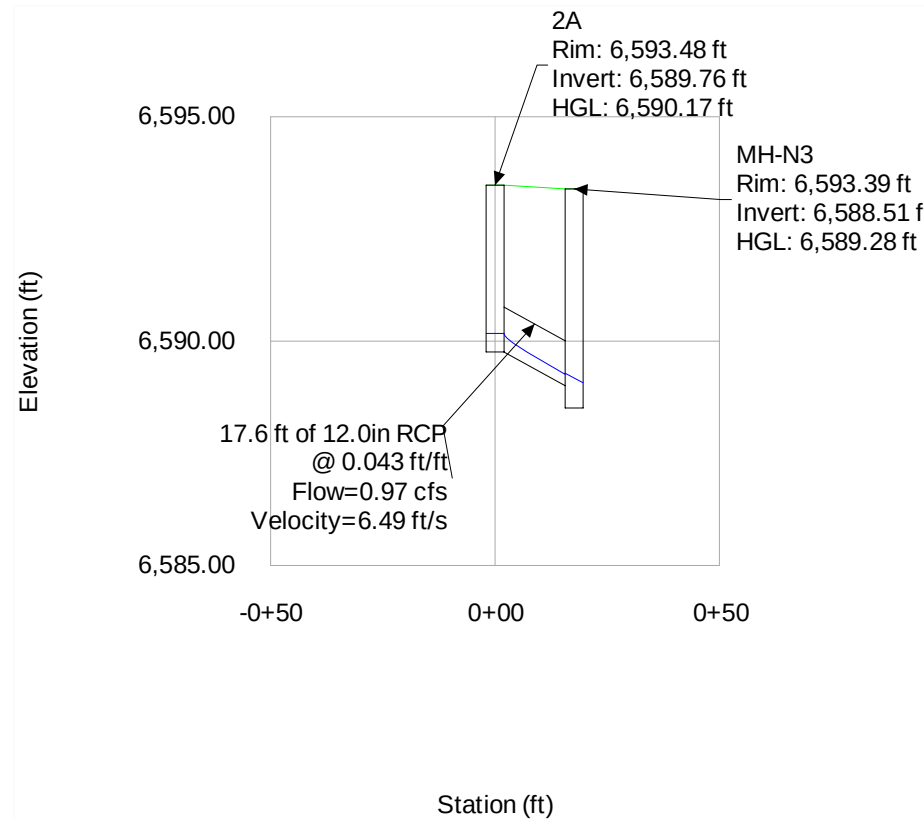
Windemere

5-Year Storm - South

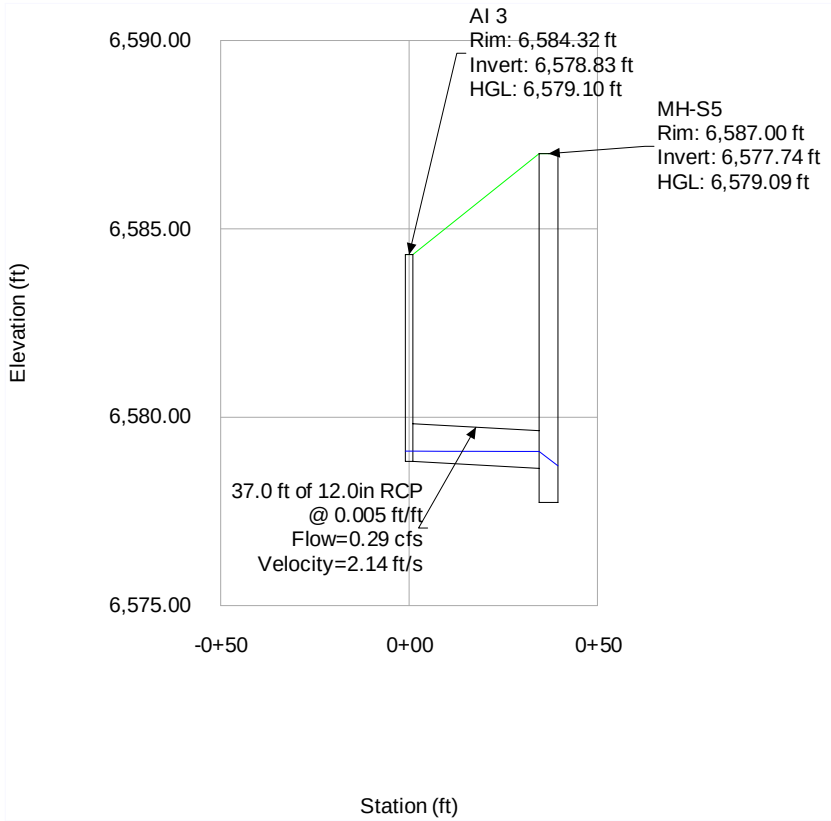


Windemere

5-Year Storm - North Lateral



Windemere
5-Year Storm - South Lateral



Windemere
100-Year
Conduit Table - Time: 0.00 hours

Start Node	Stop Node	Material	Diameter (in)	Length (User Defined) (ft)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Froude Number (Normal)
MH-N1	MH-N2	Concrete	12.0	79.7	0.013	2.66	8.25	6.94	38.3	6,602.64	6,599.35	2.551
1A	MH-N1	Concrete	12.0	15.8	0.013	2.66	8.26	6.94	38.3	6,603.34	6,603.06	2.552
MH-N2	MH-N3	Concrete	12.0	258.5	0.013	2.66	8.25	6.94	38.3	6,599.52	6,589.71	2.551
1B	2B	Concrete	18.0	84.6	0.013	5.60	6.57	11.74	47.7	6,592.05	6,591.73	1.536
MH-S2	1B	Concrete	12.0	50.2	0.013	0.72	3.61	3.65	19.7	6,592.52	6,592.05	1.368
MH-S1	MH-S2	Concrete	12.0	100.7	0.013	0.72	5.01	5.78	12.4	6,595.27	6,592.69	2.152
AI 1	MH-S1	Concrete	12.0	30.7	0.013	0.72	5.01	5.79	12.4	6,596.18	6,595.26	2.153
2B	MH-S3	Concrete	18.0	11.2	0.013	13.88	7.85	11.76	118.0	6,591.73	6,591.54	1.131
MH-S3	AI 2	Concrete	18.0	120.6	0.013	13.88	11.21	17.94	77.4	6,591.12	6,587.22	2.115
2A	MH-N3	Concrete	12.0	17.6	0.013	2.22	8.20	7.35	30.2	6,590.40	6,589.71	2.733
MH-N3	MH-N4	Concrete	18.0	156.4	0.013	4.88	7.05	13.58	35.9	6,589.36	6,586.52	1.816
AI 2	MH-S4	Concrete	18.0	54.7	0.013	15.34	11.54	18.19	84.4	6,587.54	6,586.29	2.064
MH-S4	MH-S5	Concrete	18.0	204.9	0.013	15.34	11.54	18.19	84.3	6,585.80	6,580.43	2.065
MH-N4	05 (STRM)	Concrete	18.0	91.7	0.013	4.88	11.83	27.76	17.6	6,586.64	6,579.82	3.777
MH-S5	3B	Concrete	24.0	127.3	0.013	16.44	5.23	22.63	72.7	6,580.00	6,579.33	1.329
AI 3	MH-S5	Concrete	12.0	37.0	0.013	1.10	1.40	2.52	43.7	6,580.47	6,580.43	0.916
MH-S6	MH-S7	Concrete	24.0	53.1	0.013	27.15	8.64	20.38	133.2	6,578.36	6,577.51	1.077
MH-S7	34 (STRM)	Concrete	30.0	55.9	0.013	27.15	7.05	30.64	88.6	6,577.01	6,576.65	0.942
3B	MH-S6	Concrete	24.0	15.7	0.013	27.15	8.64	22.63	120.0	6,579.33	6,579.10	1.077

Catch Basin Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Inlet Location	Inlet Type
AI 1	6,598.33	6,595.83	Standard	0.000	0.00	6,596.18	6,596.18	In Sag	Full Capture
1B	6,603.47	6,591.14	Standard	0.000	0.00	6,592.05	6,592.05	In Sag	Full Capture

Windemere

100-Year

Catch Basin Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Inlet Location	Inlet Type
2B	6,600.65	6,589.98	Standard	0.000	0.00	6,591.73	6,591.73	In Sag	Full Capture
AI 2	6,590.09	6,586.13	Standard	0.000	0.00	6,587.54	6,587.54	In Sag	Full Capture
AI 3	6,584.32	6,578.83	Standard	0.000	0.00	6,580.47	6,580.47	In Sag	Full Capture
3B	6,584.20	6,576.37	Standard	0.000	0.00	6,579.33	6,579.33	In Sag	Full Capture
1A	6,605.88	6,602.64	Standard	0.000	0.00	6,603.34	6,603.34	In Sag	Full Capture
2A	6,593.48	6,589.76	Standard	0.000	0.00	6,590.40	6,590.40	In Sag	Full Capture

Manhole Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)
MH-N1	6,606.02	6,601.94	2.66	6,603.06	6,602.64	Standard	1.320	0.42
MH-N2	6,603.50	6,598.82	2.66	6,599.53	6,599.52	Standard	0.050	0.02
MH-S2	6,602.77	6,592.17	0.72	6,592.69	6,592.52	Standard	1.320	0.17
MH-S1	6,602.75	6,594.92	0.72	6,595.36	6,595.27	Standard	0.640	0.08
MH-S3	6,600.79	6,589.74	13.88	6,591.54	6,591.12	Standard	0.400	0.41
MH-N3	6,593.39	6,588.51	4.88	6,589.71	6,589.36	Standard	1.020	0.35
MH-S4	6,592.55	6,584.39	15.34	6,586.29	6,585.80	Standard	0.400	0.49
MH-N4	6,590.41	6,585.80	4.88	6,586.68	6,586.64	Standard	0.100	0.03
MH-S5	6,587.00	6,577.74	16.44	6,580.43	6,580.00	Standard	1.020	0.43
MH-S7	6,584.98	6,575.18	27.15	6,577.51	6,577.01	Standard	0.640	0.49
MH-S6	6,584.44	6,576.11	27.15	6,579.10	6,578.36	Standard	0.640	0.74

Outfall Table - Time: 0.00 hours

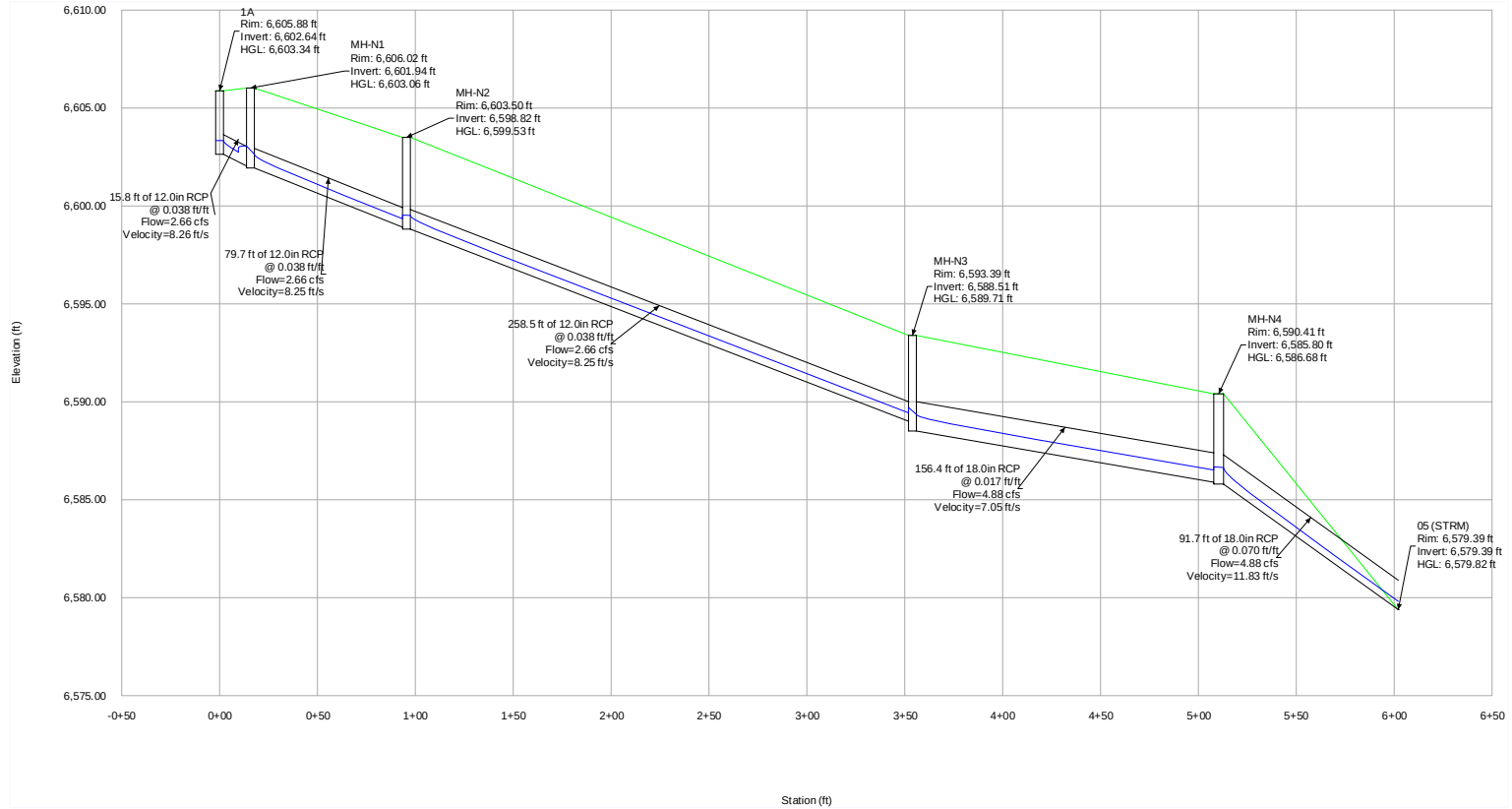
Windemere

100-Year

Outfall Table - Time: 0.00 hours

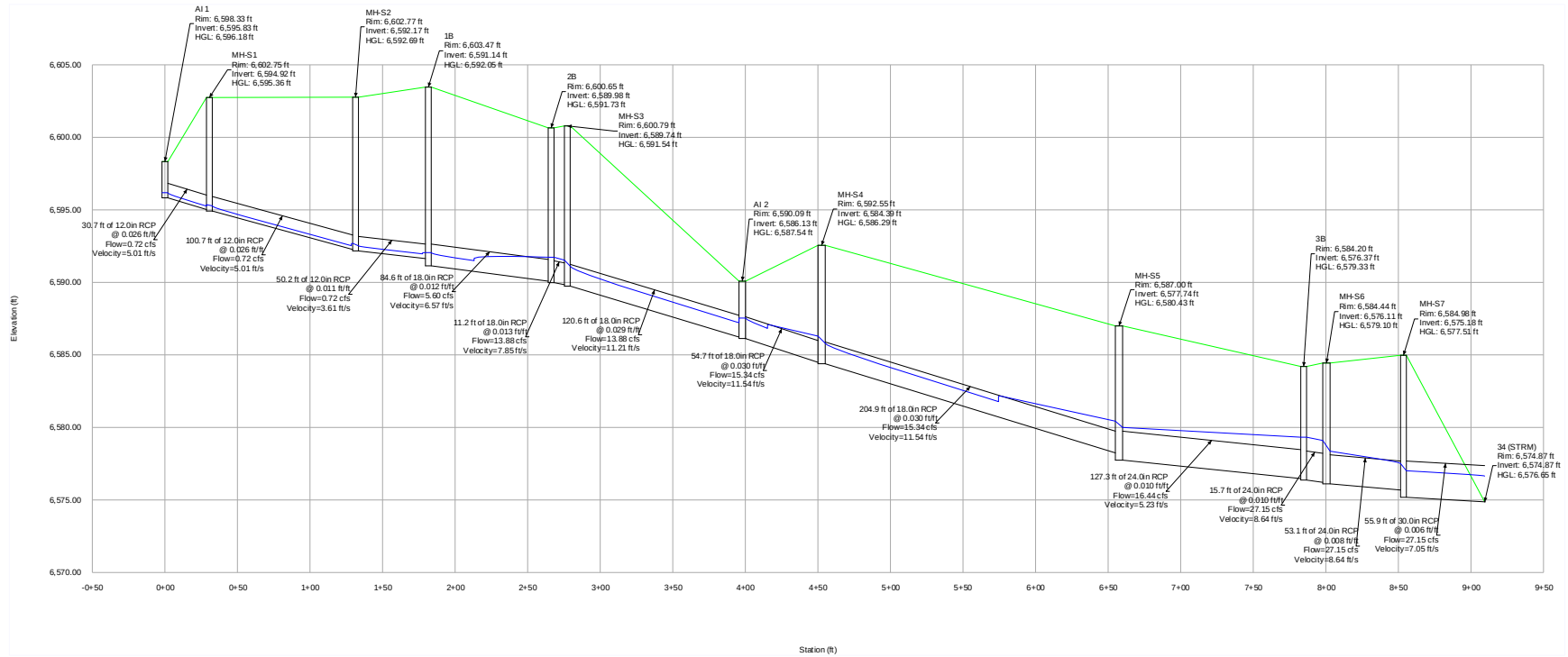
Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
05 (STRM)	6,579.39	6,579.39	Free Outfall	0.00	6,579.82	4.88
34 (STRM)	6,574.87	6,574.87	Free Outfall	0.00	6,576.65	27.15

Windemere 100-Year Storm - North



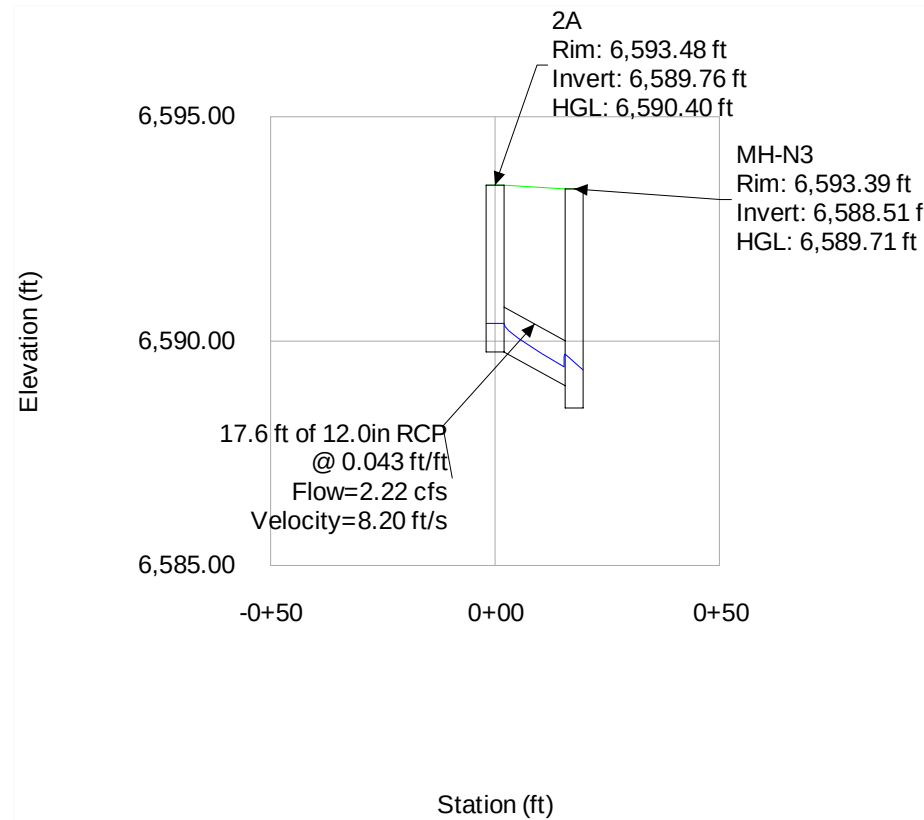
Windemere

100-Year Storm - South



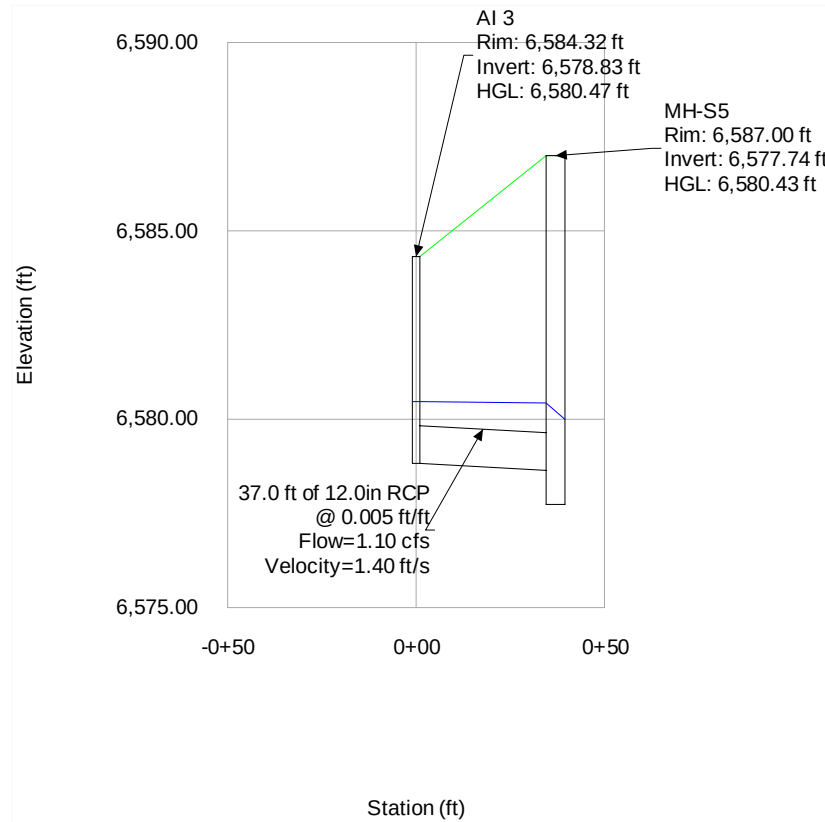
Windemere

100-Year Storm - North Lateral



Windemere

100-Year Storm - South Lateral



INLET MANAGEMENT

Project: Windemere Filing No. 2
 Minor: 5-year
 Major: 100-year

Worksheet Protected

INLET NAME	P1	P2	P3	P4	P6
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening
Number of Inlet Units	1	1	1	1	1

USER-DEFINED INPUT

User-Defined Peak Flows					
Minor Peak Flow, Q (cfs)	1.27	2.39	2.64	4.32	8.25
Major Peak Flow, Q (cfs)	2.72	5.30	5.07	8.66	16.53
Bypass (Carry-Over) Flow from Upstream <i>Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.</i>					
Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Bypass Flow Description (Optional):					
Minor Bypass Flow Received, Q _b (cfs)	0.00	0.00	0.00	0.00	0.00
Major Bypass Flow Received, Q _b (cfs)	0.00	0.00	0.00	0.00	0.00

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.27	2.39	2.64	4.32	8.25
Major Total Design Peak Flow, Q (cfs)	2.72	5.30	5.07	8.66	16.53
Minor Inlet Interception Capacity, Q _i (cfs)	2.76	2.76	2.76	6.67	12.26
Major Inlet Interception Capacity, Q _i (cfs)	5.93	5.93	5.93	10.02	17.28
Minor Flow Bypassed Downstream, Q _b (cfs)	N/A	N/A	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q _b (cfs)	N/A	N/A	N/A	N/A	N/A
Minor Flow Capture Percentage, C%	100%	100%	100%	100%	100%
Major Flow Capture Percentage, C%	100%	100%	100%	100%	100%

INLET MANAGEMENT

Project: Windemere Filing No. 2

Minor: 5-year

Major: 100-year

Worksheet Protected

INLET NAME	D10	D5	D7
Inlet Application (Street or Area)	AREA	AREA	AREA
Hydraulic Condition	Swale	Swale	Swale
Inlet Type	CDOT Type C	CDOT Type C	CDOT Type C
Number of Inlet Units	1	1	1

USER-DEFINED INPUT

User-Defined Peak Flows			
Minor Peak Flow, Q (cfs)	0.22	0.24	0.30
Major Peak Flow, Q (cfs)	0.75	1.48	1.15
Bypass (Carry-Over) Flow from Upstream			
Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Bypass Flow Description (Optional):			
Minor Bypass Flow Received, Q _b (cfs)	0.00	0.00	0.00
Major Bypass Flow Received, Q _b (cfs)	0.00	0.00	0.00

CALCULATED OUTPUT

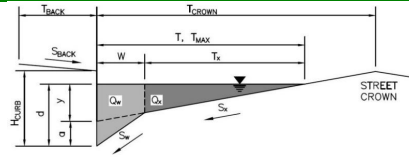
Minor Total Design Peak Flow, Q (cfs)	0.22	0.24	0.30
Major Total Design Peak Flow, Q (cfs)	0.75	1.48	1.15
Minor Inlet Interception Capacity, Q _i (cfs)	0.92	1.54	1.39
Major Inlet Interception Capacity, Q _i (cfs)	1.84	3.82	2.95
Minor Flow Bypassed Downstream, Q _b (cfs)	0.00	0.00	0.00
Major Flow Bypassed Downstream, Q _b (cfs)	0.00	0.00	0.00
Minor Flow Capture Percentage, C%	100%	100%	100%
Major Flow Capture Percentage, C%	100%	100%	100%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Windemere Filing No. 2

Inlet ID: D1

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.010	ft/ft
n_{BACK}	=	0.013	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	30.0	ft
W	=	1.00	ft
S_x	=	0.025	ft/ft
S_y	=	0.083	ft/ft
S_0	=	0.000	ft/ft
n_{STREET}	=	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	18.0	30.0	ft
d_{MAX}	4.0	6.0	inches

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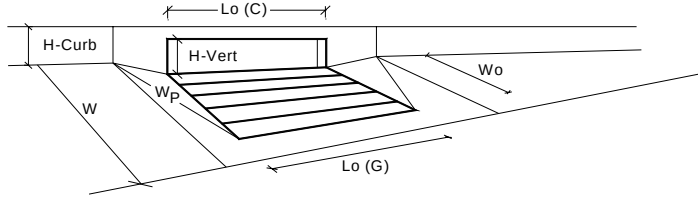
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)



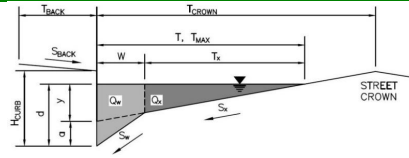
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	6.0	inches
<u>Grate Information</u>		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G)$ =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_r (G)$ =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$ =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$ =	N/A	N/A	
<u>Curb Opening Information</u>		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_r (C)$ =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C)$ =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C)$ =	0.67	0.67	
<u>Low Head Performance Reduction (Calculated)</u>		MINOR		MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.25	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q_s =	2.8	5.9	cfs
		$Q_{PEAK REQUIRED}$ =	1.3	2.7	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Windemere Filing No. 2

Inlet ID: D2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.010	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	30.0	ft
$W =$	1.00	ft
$S_c =$	0.030	ft/ft
$S_w =$	0.083	ft/ft
$S_0 =$	0.000	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	18.0	30.0	ft
$d_{MAX} =$	4.0	6.0	inches

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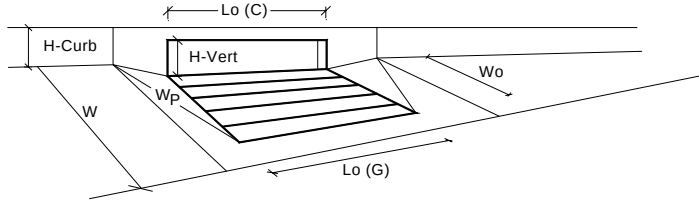
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

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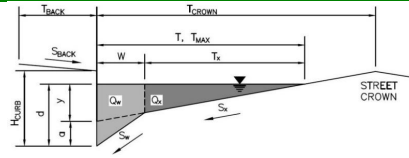
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	6.0	inches
<u>Grate Information</u>		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _r (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
<u>Curb Opening Information</u>		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
<u>Low Head Performance Reduction (Calculated)</u>		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.25	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	2.8	5.9	cfs
		Q _{PEAK REQUIRED} =	2.4	5.3	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Windemere Filing No. 2

Inlet ID: D3

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.010	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	30.0	ft
$W =$	1.00	ft
$S_x =$	0.045	ft/ft
$S_w =$	0.083	ft/ft
$S_0 =$	0.000	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	18.0	30.0	ft
$d_{MAX} =$	4.0	6.0	inches



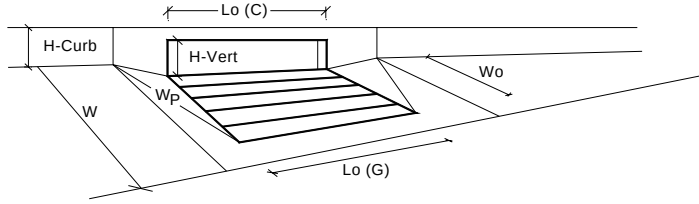
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

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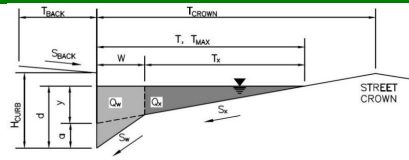
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	6.0	inches
<u>Grate Information</u>		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _r (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
<u>Curb Opening Information</u>		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
<u>Low Head Performance Reduction (Calculated)</u>		MINOR		MAJOR	
Depth for Grate Midwidth		d _{grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{curb} =	0.25	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	2.8	5.9	cfs
		Q _{PEAK REQUIRED} =	2.6	5.1	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Windemere Filing No. 2

Inlet ID: D4

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.010	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	30.0	ft
$W =$	1.00	ft
$S_x =$	0.030	ft/ft
$S_w =$	0.083	ft/ft
$S_0 =$	0.000	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	24.0	30.0	ft
$d_{MAX} =$	5.0	6.0	inches

☐ ☐

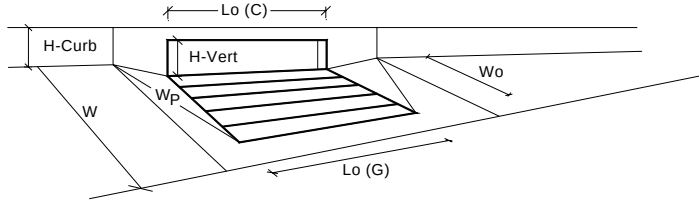
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)



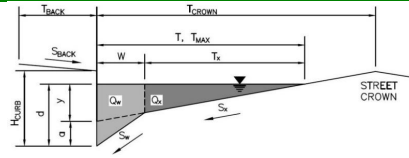
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.0	6.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _r (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.33	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.87	0.93	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _a =	6.7	10.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _{PEAK REQUIRED} =	4.3	8.7	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Windemere Filing No. 2

Inlet ID: D6

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.010	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	30.0	ft
$W =$	1.00	ft
$S_x =$	0.035	ft/ft
$S_w =$	0.083	ft/ft
$S_0 =$	0.000	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	24.0	30.0	ft
$d_{MAX} =$	6.0	7.0	inches

☐ ☐

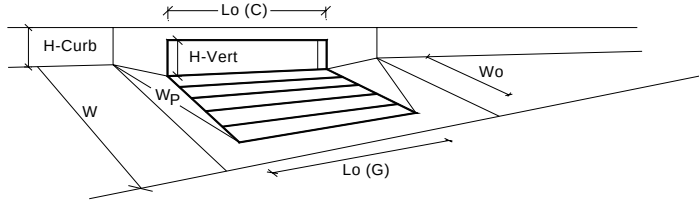
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)

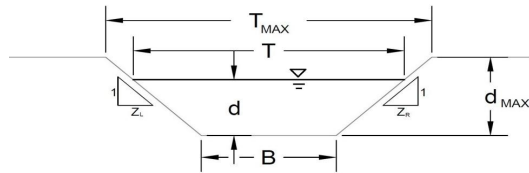


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	7.0	inches
<u>Grate Information</u>		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _r (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
<u>Curb Opening Information</u>		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
<u>Low Head Performance Reduction (Calculated)</u>		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.42	0.50	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.79	0.84	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _a =	12.3	17.3	cfs
		Q _{PEAK REQUIRED} =	8.3	16.5	cfs

AREA INLET IN A SWALE

Windemere Filing No. 2

D10



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

A, B, C, D, or E =

E
n = see details below
$S_0 = 0.0350$ ft/ft
B = 0.00 ft
Z1 = 10.00 ft/ft
Z2 = 33.00 ft/ft

Choose One:

- ☒ Non-Cohesive
☐ Cohesive
☐ Paved

	Minor Storm	Major Storm
$T_{MAX} =$	6.00	10.00
$d_{MAX} =$	0.50	1.25

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Top Width Criterion

MAJOR STORM Allowable Capacity is based on Top Width Criterion

	Minor Storm	Major Storm
$Q_{allow} =$	0.2	0.9
$d_{allow} =$	0.14	0.23

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

$Q_o =$	0.2	0.7
$d =$	0.14	0.21

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Windemere Filing No. 2
D10

Inlet Design Information (Input)

Type of Inlet

CDOT Type C

Inlet Type =

CDOT Type C

Angle of Inclined Grate (must be ≤ 30 degrees)

Width of Grate

Length of Grate

Open Area Ratio

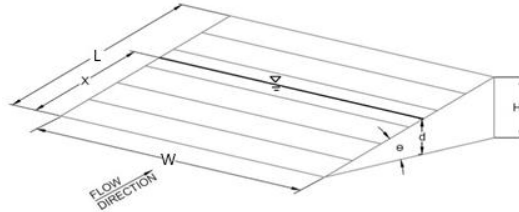
Height of Inclined Grate

Clogging Factor

Grate Discharge Coefficient

Orifice Coefficient

Weir Coefficient

 $\theta =$ 0.00 degrees $W =$ 3.00 ft $L =$ 3.00 ft $A_{\text{RATIO}} =$ 0.70 $H_b =$ 0.00 ft $C_f =$ 0.50 $C_d =$ 0.96 $C_o =$ 0.64 $C_w =$ 2.05

Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

Total Inlet Interception Capacity (assumes clogged condition)

Bypassed Flow

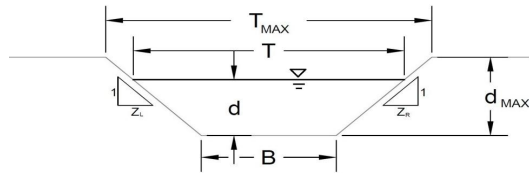
Capture Percentage = Q_a/Q_o

	MINOR	MAJOR	
$d =$	0.14	0.21	
$Q_a =$	0.9	1.8	cfs
$Q_b =$	0.0	0.0	cfs
$C\% =$	100	100	%

AREA INLET IN A SWALE

Windemere Filing No. 2

D5



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{max})	Max Froude No. (F_{max})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

A, B, C, D, or E =

E

n = see details below

 S_0 = 0.0200 ft/ft

B = 0.00 ft

 Z_1 = 5.00 ft/ft Z_2 = 20.00 ft/ft

Choose One:

☒ Non-Cohesive☐ Cohesive☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX}	5.00	10.00	ft
d_{MAX}	1.00	2.00	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Top Width Criterion

MAJOR STORM Allowable Capacity is based on Top Width Criterion

	Minor Storm	Major Storm	
Q_{allow}	0.3	2.5	cfs
d_{allow}	0.20	0.40	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

	Minor Storm	Major Storm	
Q_o	0.2	1.5	cfs
d	0.19	0.35	ft

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

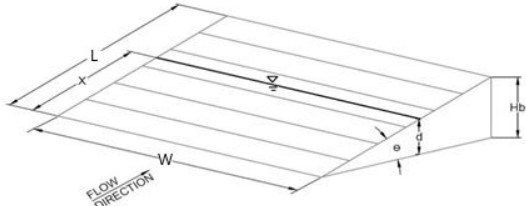
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

MHFD-Inlet, Version 6.00 (August 2025)

AREA INLET IN A SWALE

Windemere Filing No. 2
D5

Inlet Design Information (Input)	
Type of Inlet	CDOT Type C
Inlet Type = CDOT Type C	
Angle of Inclined Grate (must be ≤ 30 degrees)	$\theta = 0.00$ degrees
Width of Grate	$W = 3.00$ ft
Length of Grate	$L = 3.00$ ft
Open Area Ratio	$A_{\text{RATIO}} = 0.70$
Height of Inclined Grate	$H_B = 0.00$ ft
Clogging Factor	$C_f = 0.50$
Grate Discharge Coefficient	$C_d = 0.96$
Orifice Coefficient	$C_o = 0.64$
Weir Coefficient	$C_w = 2.05$



Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

Total Inlet Interception Capacity (assumes clogged condition)

Bypassed Flow

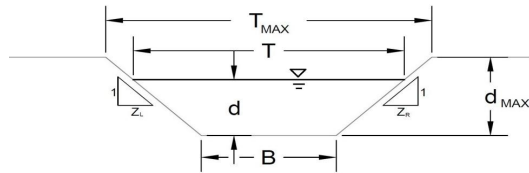
Capture Percentage = Q_a/Q_o

	MINOR	MAJOR	
$d =$	0.19	0.35	
$Q_a =$	1.5	3.8	cfs
$Q_b =$	0.0	0.0	cfs
$C\% =$	100	100	%

AREA INLET IN A SWALE

Windemere Filing No. 2

D7



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{max})	Max Froude No. (F_{max})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

A, B, C, D, or E =

E

n = see details below

 S_0 = 0.0100 ft/ft

B = 0.00 ft

Z1 = 20.00 ft/ft

Z2 = 33.00 ft/ft

Choose One:

- ☒ Non-Cohesive
☐ Cohesive
☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX}	10.00	16.00	ft
d_{MAX}	1.00	2.25	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Top Width Criterion

MAJOR STORM Allowable Capacity is based on Top Width Criterion

	Minor Storm	Major Storm	
Q_{allow}	0.4	1.2	cfs
d_{allow}	0.19	0.30	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

	Minor Storm	Major Storm	
Q_o	0.3	1.2	cfs
d	0.18	0.29	ft

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Windemere Filing No. 2

D7

Inlet Design Information (Input)

Type of Inlet

CDOT Type C

Inlet Type =

CDOT Type C

Angle of Inclined Grate (must be ≤ 30 degrees)

Width of Grate

Length of Grate

Open Area Ratio

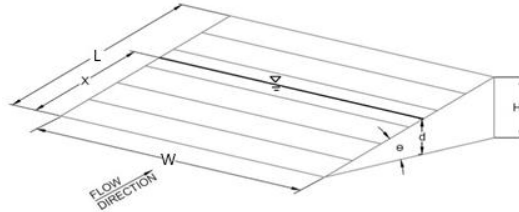
Height of Inclined Grate

Clogging Factor

Grate Discharge Coefficient

Orifice Coefficient

Weir Coefficient

 $\theta =$ 0.00 degrees

W = 3.00 ft

L = 3.00 ft

 $A_{\text{RATIO}} =$ 0.70 $H_g =$ 0.00 ft $C_l =$ 0.50 $C_d =$ 0.96 $C_o =$ 0.64 $C_w =$ 2.05

Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

Total Inlet Interception Capacity (assumes clogged condition)

Bypassed Flow

Capture Percentage = Q_a/Q_o

MINOR

MAJOR

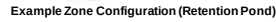
d = 0.18 0.29

 $Q_a =$ 1.4 3.0 cfs $Q_b =$ 0.0 0.0 cfs

C% = 100 100 %

MHFD-Detention, Version 4.06 (July 2022)

Basin ID: Pond Proposed Conditions

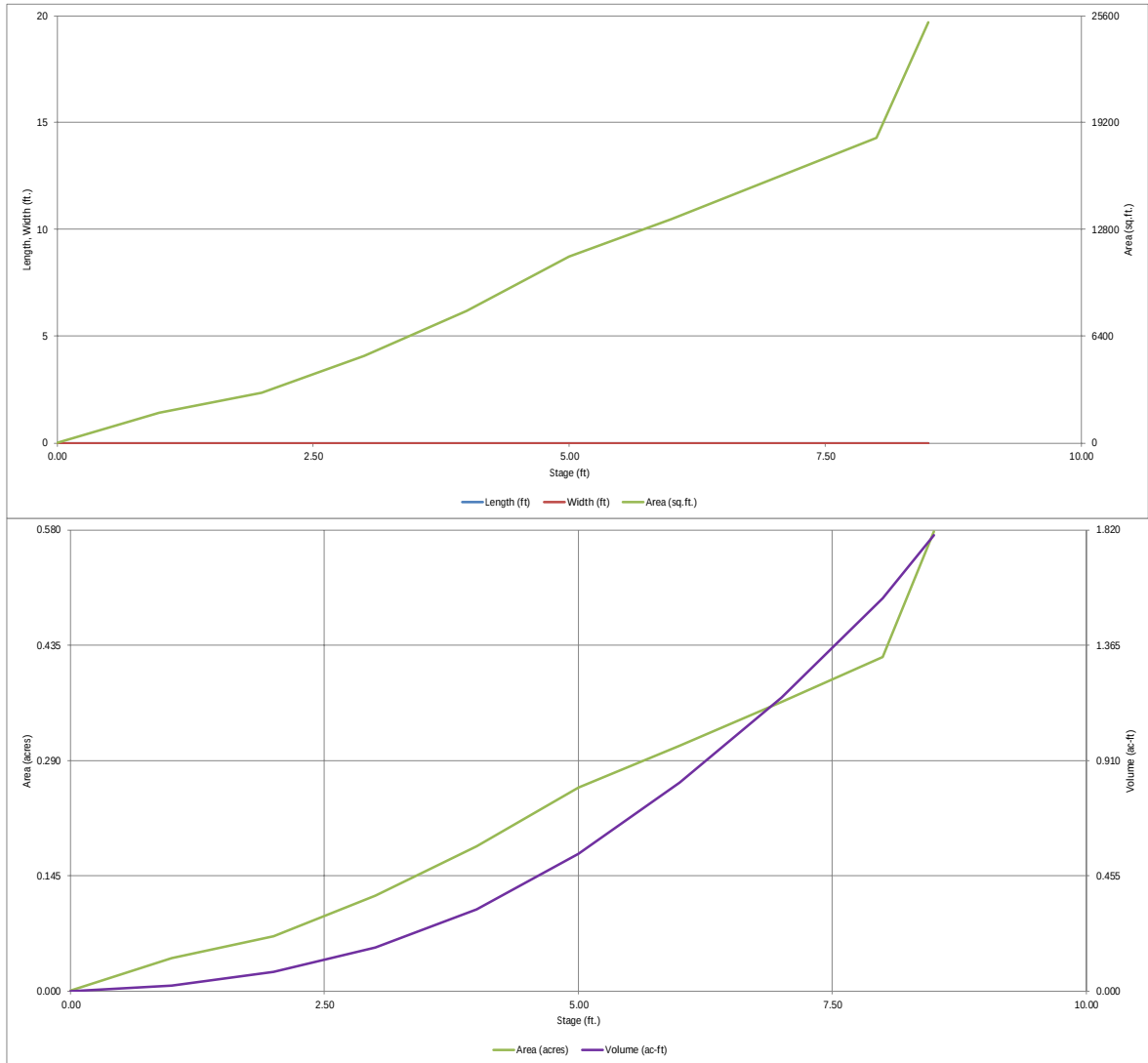


	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.49	inches

2/25/2026, 11:16 AM

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

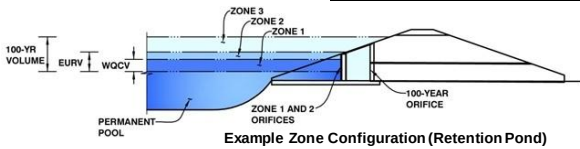
MHFD-Detention, Version 4.06 (July 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Windemere Filing No. 2
Basin ID: Pond Proposed Conditions



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.49	0.237	Orifice Plate
Zone 2 (EURV)	6.19	0.645	Orifice Plate
Zone 3 (100-year)	7.47	0.452	Weir&Pipe (Restrict)
Total (all zones)		1.334	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain	
Underdrain Orifice Area =	N/A ft ²
Underdrain Orifice Centroid =	N/A feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	6.34	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. inches

Calculated Parameters for Plate	
WQ Orifice Area per Row =	N/A ft ²
Elliptical Half-Width =	N/A feet
Elliptical Slot Centroid =	N/A feet
Elliptical Slot Area =	N/A ft ²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.20	4.20					
Orifice Area (sq. inches)	1.24	1.24	1.24					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice	
Vertical Orifice Area =	N/A ft ²
Vertical Orifice Centroid =	N/A feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	6.40	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.93	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

(e)		Calculated Parameters for Overflow Weir		
		Zone 3 Weir	Not Selected	
ft)	Height of Grate Upper Edge, H_1 =	6.40	N/A	feet
	Overflow Weir Slope Length =	3.93	N/A	feet
	Grate Open Area / 100-yr Orifice Area =	16.87	N/A	
	Overflow Grate Open Area w/o Debris =	10.72	N/A	ft ²
	Overflow Grate Open Area w/ Debris =	5.36	N/A	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	7.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate			
	Zone 3 Restrictor	Not Selected	
at Stage = 0 ft)			
Outlet Orifice Area =	0.64	N/A	ft ²
Outlet Orifice Centroid =	0.34	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.35	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.94	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	27.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway		
Spillway Design Flow Depth=	0.51	feet
Stage at Top of Freeboard =	8.45	feet
Basin Area at Top of Freeboard =	0.56	acres
Basin Volume at Top of Freeboard =	1.77	acre-ft

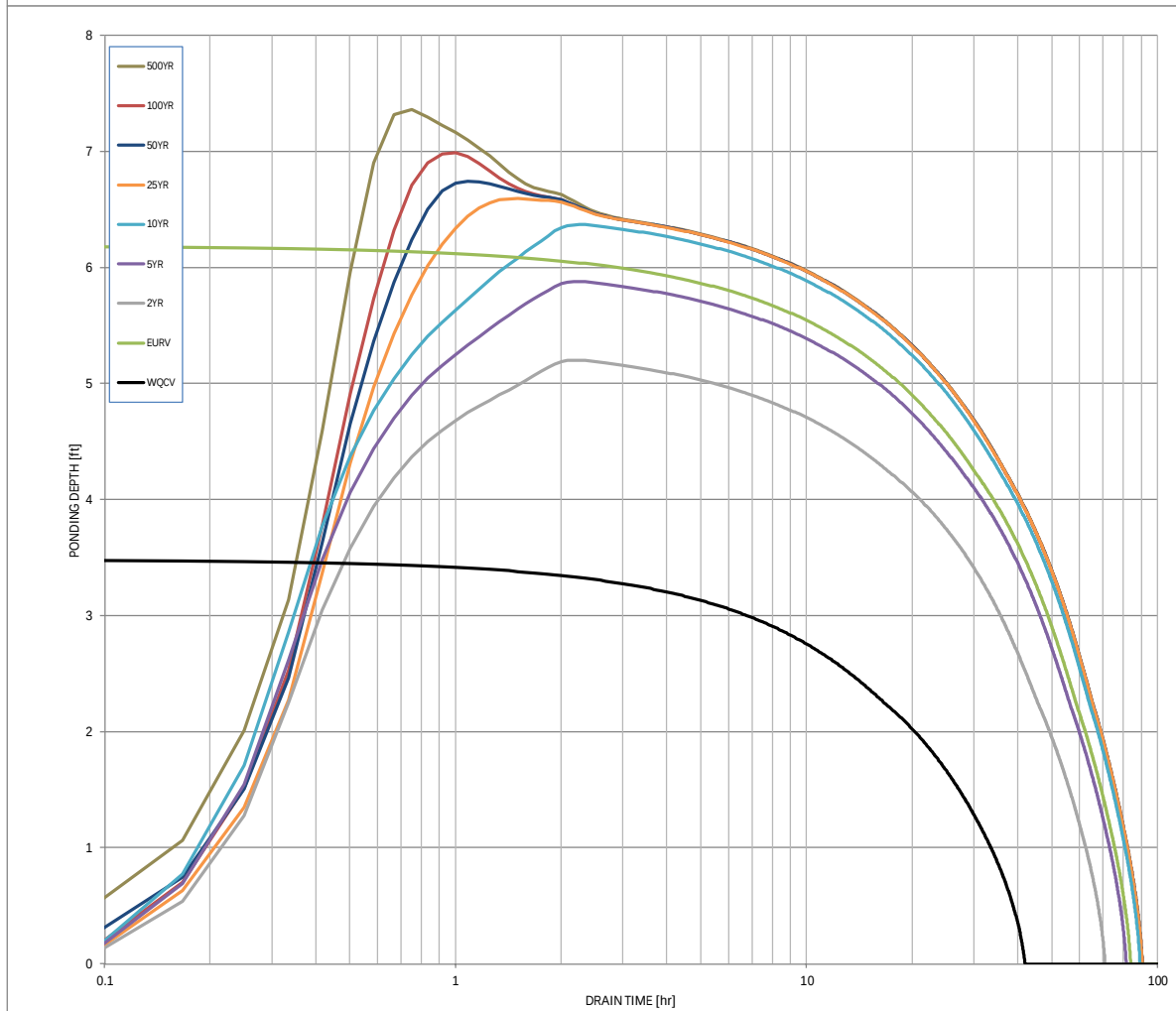
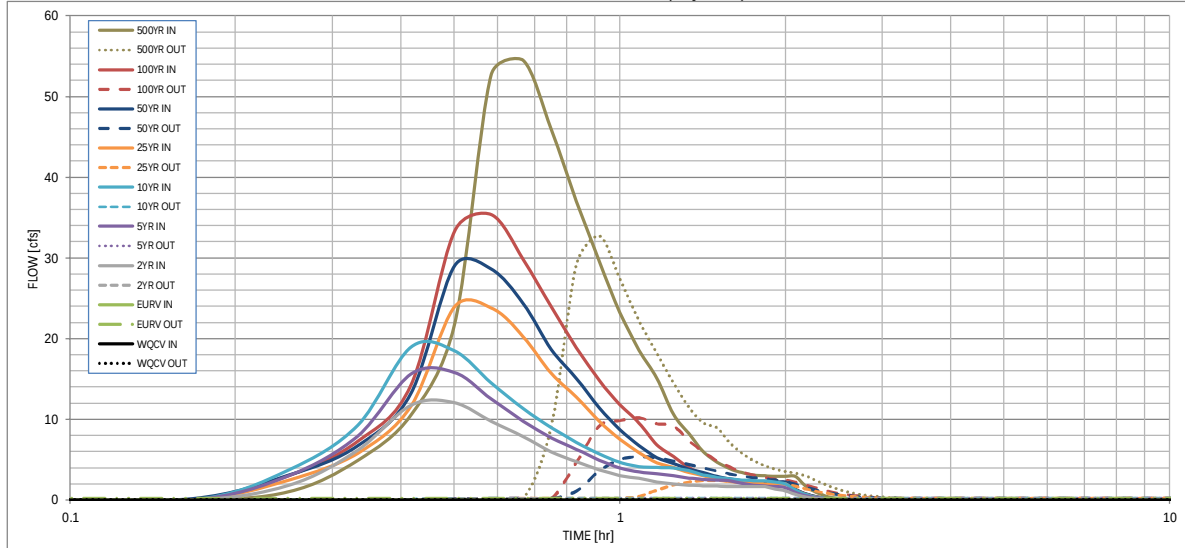
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
One-Hour Rainfall Depth (in) =	0.237	0.882	0.625	0.822	0.980	1.194	1.404	1.663	2.560
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.625	0.822	0.980	1.194	1.404	1.663	2.560
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.1	0.2	0.3	3.0	5.8	9.4	21.3
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.02	0.03	0.25	0.49	0.79	1.79
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	12.1	15.8	19.0	24.0	29.1	35.4	54.5
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.1	0.2	0.3	2.4	5.4	10.2	32.8
Peak Inflow Q (cfs) =	N/A	N/A	0.2	1.0	0.7	0.8	0.9	1.1	1.5
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway
Structure Controlling Flow =	N/A	N/A	N/A	N/A	N/A	0.2	0.5	0.8	0.9
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	38	74	63	72	78	78	77	75	69
Time to Drain 97% of Inflow Volume (hours) =	40	79	67	77	84	85	84	83	81
Time to Drain 99% of Inflow Volume (hours) =	3.49	6.19	5.20	5.88	6.37	6.60	6.75	6.99	7.36
Maximum Ponding Depth (ft) =	0.15	0.32	0.27	0.30	0.33	0.34	0.35	0.36	0.38
Area at Maximum Ponding Depth (acres) =	0.237	0.883	0.593	0.787	0.941	1.015	1.066	1.156	1.294
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.06 (July 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.02	1.05
	0:15:00	0.00	0.00	1.87	3.04	3.77	2.53	3.11	3.08	4.94
	0:20:00	0.00	0.00	6.19	7.97	9.33	5.85	6.76	7.32	10.60
	0:25:00	0.00	0.00	11.81	15.64	18.97	11.70	13.29	14.30	21.81
	0:30:00	0.00	0.00	12.06	15.83	18.50	23.96	29.09	33.38	52.71
	0:35:00	0.00	0.00	9.79	12.56	14.57	23.87	28.63	35.45	54.54
	0:40:00	0.00	0.00	7.87	9.83	11.34	20.30	24.36	29.82	45.94
	0:45:00	0.00	0.00	6.02	7.74	9.04	15.70	18.70	23.96	37.09
	0:50:00	0.00	0.00	4.76	6.33	7.19	12.78	15.12	18.93	29.63
	0:55:00	0.00	0.00	3.79	4.99	5.76	9.77	11.46	14.86	23.26
	1:00:00	0.00	0.00	3.07	3.99	4.69	7.56	8.78	11.88	18.62
	1:05:00	0.00	0.00	2.72	3.49	4.20	5.92	6.77	9.59	15.13
	1:10:00	0.00	0.00	2.28	3.31	4.05	4.68	5.31	6.88	10.68
	1:15:00	0.00	0.00	2.03	3.05	4.00	4.06	4.59	5.43	8.26
	1:20:00	0.00	0.00	1.89	2.77	3.65	3.43	3.86	4.06	6.03
	1:25:00	0.00	0.00	1.80	2.60	3.17	3.04	3.42	3.25	4.73
	1:30:00	0.00	0.00	1.75	2.49	2.85	2.62	2.94	2.76	3.94
	1:35:00	0.00	0.00	1.71	2.42	2.65	2.35	2.64	2.44	3.42
	1:40:00	0.00	0.00	1.69	2.11	2.52	2.18	2.45	2.25	3.12
	1:45:00	0.00	0.00	1.69	1.90	2.44	2.08	2.34	2.18	3.02
	1:50:00	0.00	0.00	1.69	1.77	2.38	2.03	2.28	2.15	2.97
	1:55:00	0.00	0.00	1.38	1.70	2.27	2.00	2.25	2.14	2.97
	2:00:00	0.00	0.00	1.18	1.57	2.02	1.99	2.23	2.14	2.97
	2:05:00	0.00	0.00	0.73	0.98	1.27	1.25	1.40	1.34	1.85
	2:10:00	0.00	0.00	0.45	0.60	0.78	0.77	0.87	0.83	1.14
	2:15:00	0.00	0.00	0.26	0.35	0.46	0.46	0.51	0.49	0.67
	2:20:00	0.00	0.00	0.14	0.20	0.26	0.26	0.30	0.28	0.38
	2:25:00	0.00	0.00	0.07	0.11	0.13	0.14	0.15	0.15	0.20
	2:30:00	0.00	0.00	0.02	0.04	0.05	0.05	0.06	0.05	0.07
	2:35:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

Designer: TK, Reviewed by JM
 Company: Kimley-Horn
 Date: March 24, 2026
 Project: Windemere
 Location: Proposed Forebay A (Sub-basins 3-7, 10-12)

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * \text{Area})$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_s * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) NRCS Hydrologic Soil Groups of Tributary Watershed
 i) Percentage of Watershed consisting of Type A Soils
 ii) Percentage of Watershed consisting of Type B Soils
 iii) Percentage of Watershed consisting of Type C/D Soils
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{CD} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume
(Only if a different EURV Design Volume is desired)

$I_a = 69.0$ %

$i = 0.690$

Area = 5.730 ac

$d_s =$ in

Choose One

- ☒ Water Quality Capture Volume (WQCV)
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 0.129$ ac-ft

$V_{DESIGN\ OTHER} =$ ac-ft

$V_{DESIGN\ USER} =$ ac-ft

HSG $A =$ %

HSG $B =$ %

HSG $C/D =$ %

$EURV_{DESIGN} =$ ac-ft

$EURV_{DESIGN\ USER} =$ ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

$L : W =$: 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

$Z =$ ft / ft

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

Forebay with T-Baffle block

5. Forebay

- A) Minimum Forebay Volume
($V_{MIN} = 2\%$ of the WQCV)

$V_{MIN} = 0.003$ ac-ft

- B) Actual Forebay Volume

$V_F = 0.003$ ac-ft

- C) Forebay Depth
($D_F = 18$ inch maximum)

$D_F = 18.0$ in

- D) Forebay Discharge

- i) Undetained 100-year Peak Discharge

$Q_{100} = 30.31$ cfs

- ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)

$Q_F = 0.61$ cfs

- E) Forebay Discharge Design

Choose One

- ☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

Flow too small for berm w/ pipe

- F) Discharge Pipe Size (minimum 8-inches)

Calculated $D_p =$ in

- G) Rectangular Notch Width

Calculated $W_n = 4.8$ in

***APPENDIX D - PRELIMINARY DRAINAGE REPORT FOR WINDERMERE FILING
No. 2 - DREXEL, BARRELL & CO.***

PRELIMINARY DRAINAGE REPORT
for
WINDERMERE FILING NO. 2

Colorado Springs, CO

June 2025

Prepared for:

Colo Windermere #2, LLC
4164 Austin Bluffs Parkway, #361
Colorado Springs, CO 80918
Contact: James Todd Stephens

Prepared by:

Drexel, Barrell & Co.
101 Sawatch St, Suite 100
Colorado Springs, CO 80903
Contact: Tim McConnell, P.E.
(719) 260-0887

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APPENDICES

VICINITY MAP
SOILS MAP
FLOODPLAIN MAP
APPROVED DRAINAGE REPORT EXCERPTS
DRAINAGE CALCULATIONS
DRAINAGE MAP

PRELIMINARY DRAINAGE REPORT

for

WINDERMERE FILING NO. 2

Colorado Springs, Colorado

1.0 CERTIFICATION STATEMENTS

ENGINEER'S STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports, and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omission on my part in preparing this report.

Tim D. McConnell, P.E.
Colorado P.E. License No. 33797
For and on Behalf of Drexel, Barrell & Co.



6/27/25

Date

DEVELOPER'S STATEMENT

I, the developer have read and will comply with all the requirements specified in this drainage report and plan.

Business Name: Colo Windermere #2, LLC

By:


James Todd Stephens

6/27/25

Date

Title:

Owner

Address:

4164 Austin Bluffs Parkway, #361
Colorado Springs, CO 80918

EL PASO COUNTY

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual Volumes 1 and 2, and the Engineering Criteria Manual, as amended.

County Engineer/ECM Administrator

Date

CONDITIONS

PRELIMINARY DRAINAGE REPORT

for

WINDERMERE FILING NO. 2

Colorado Springs, Colorado

2.0 PURPOSE

This report is prepared by Drexel, Barrel & Co in support of the Windermere Filing No. 2 subdivision. This preliminary drainage report is presented in order to determine the adequacy of the existing drainage facilities based upon the anticipated development. This report is associated with a preliminary plan amendment, which triggered the need for this drainage analysis. This development is in the concept stage and as such no site work, grading or drainage and utility installation is to occur at this time. The drainage report will be required to be updated upon final layout, grading and drainage design.

3.0 GENERAL SITE DESCRIPTION

Location

The site is located at the northwest corner of N. Carefree Cir. and Marksheffel Rd. - the E 1/2 of Section 29, Township 13 S, Range 65 W of the 6th P.M., El Paso County, Colorado.

The site is bound on the west by Antelope Ridge Dr., on the north by the Windermere Filing No. 1 subdivision (Pronghorn Meadows Circle), on the east by Marksheffel Rd., and on the south by N. Carefree Cir.

Site Conditions

The site is approximately 9.26 acres in size and is proposed as a multi-family home subdivision. The proposed site development includes approximately 200 multi-family units. The site has recently been overlot graded, seeded and mulched as part of the Windermere Filing No. 1 development to the north. The site is located within the Sand Creek Drainage Basin. Historically, this site drains to the southeast towards the intersection of N. Carefree Circle and Marksheffel Road.

This site was studied as part of the approved Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1, by Classic Consulting (October 2014) and the more recently approved Final Drainage Report for Windermere Filing No. 1, by Drexel, Barrell & Co. (April 2022).

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the site is underlain by Truckton sandy loam, a type 'A' hydrologic soil. See appendix for map.

Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers

relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel #08041C0543 G (December 7, 2018) the project site is within a designated Zone X area described as "area of minimal hazard". A firmette map is included in the appendix.

4.0 HISTORIC HYDROLOGY

The existing condition described in the previously approved *Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1*, by Classic Consulting (October 2014) of the project area is presented here for reference, specifically for the offsite basins that have not changed from the time of the Classic Consulting report.

A copy of the existing conditions map from the Classic Consulting report is provided in the appendix and presented as the historic condition. Reference Section 5.0 below for the existing condition analysis.

5.0 EXISTING HYDROLOGY

As described above, the Windermere Filing No. 2 site was overlaid graded as part of the Windermere Filing No. 1 development and studied as part of the previously approved *Final Drainage Report for Windermere Filing No. 1*, by Drexel, Barrell & Co. (April 2022). A full-spectrum detention facility was designed as part of Filing No.1 and in order to minimize future grading within the detention facility area, the volume was based on assumed final build-out watershed imperviousness of 68% and an interim outlet plate installed to control the release rate for the undeveloped condition.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm recurrence intervals. See below for a summary runoff table and description of each design point.

Design Point 1 represents the flows generated by offsite basin OS1, and onsite basin E1. Flows of $Q_5=7.1$ cfs and $Q_{100}=15.7$ cfs travel via the existing private 24" RCP storm sewer to the east and discharge into the north end of the existing detention facility.

Design Point 2 represents the flows generated by onsite basin E2 ($Q_5=2.9$ cfs and $Q_{100}=16.1$ cfs). These flows sheet flow across the site, from northwest to southeast, before being discharged into the existing detention facility.

Design Point 3 represents all flows reaching the existing detention facility (DP1, DP2, OS2 and Basin E3) for a total flow of $Q_5=9.5$ cfs and $Q_{100}=32.3$ cfs. Flows exiting the facility were determined by the interim pond design completed with the Windermere Filing 1 Final Drainage Report.

Rational Method Existing Runoff Summary

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1		3.82	7.0	15.5
OS2		0.16	0.3	0.6
E1		0.03	0.2	0.3
	1	3.85	7.1	15.7
E2	2	5.70	2.9	16.1
E3		1.10	0.8	4.5
	3	10.81	9.5	32.3
D16	4	2.73	4.7	10.3
E4		1.86	0.9	5.3
	4A	4.59	4.8	13.6
E5	5	0.63	0.4	2.4
EXR		0.53	2.4	4.4
	S	5.75	6.7	18.1
NC2	19	1.61	6.4	12.2
	J1	7.36	10.5	25.5
NC1		0.43	1.9	3.4
	20	7.79	11.7	27.6

Design Point 4 is identical to DP-4-EX in the historic condition and represents flows ($Q_5=4.7\text{cfs}$ and $Q_{100}=10.3\text{cfs}$) from offsite basin D16 which discharge on to the southwest corner of the Windermere property.

Design Point 4A represents flows from offsite DP4 and onsite basin E4 ($Q_5=0.9\text{cfs}$ and $Q_{100}=5.3\text{cfs}$) reaching the intersection of N. Carefree Circle and Marksheffel Road.

Design Point S is located at the same existing public area inlet as DP-6-EX in the historic condition. In the existing condition flows reaching this point, from DP4A, DP5 and Basin EXR in addition to the interim design pond release rate will equal $Q_5=6.7\text{ cfs}$ and $Q_{100}=18.1\text{ cfs}$. Flows exit this existing public area inlet by existing public 24" RCP to the south.

Design Point 19 consists of runoff from off-site basin NC-2 with a flow of $Q_5=6.4\text{cfs}$ and $Q_{100}=12.2\text{ cfs}$). An existing public 15' Type R at-grade curb inlet just west of the intersection of N. Carefree Circle and Marksheffel Road intercepts a portion of this runoff ($Q_5=4.8\text{ cfs}$ and $Q_{100}=8.1\text{ cfs}$) and discharges to the east via existing public 18" RCP storm sewer.

Design Point J1 is located at the existing public manhole on the north side of N. Carefree Circle and represents the combining of flows from DP-19 and DP-S. Flows of $Q_5=10.5\text{ cfs}$ and $Q_{100}=25.5\text{ cfs}$ continue to the south via the existing public 30" RCP towards DP-20.

Design Point 20 consists of surface runoff from basin NC-1, flowby from the at-grade inlet at DP-19 and pipe flow from DP-J1. An existing public 10' Type R sump inlet intercepts all the surface runoff and combines it with the upstream flows from DP-J1 and DP-19 existing at-grade inlet capture. Total developed runoff at this location is $Q_5=11.7$ cfs and $Q_{100}=27.6$ cfs. This runoff continues within the existing Marksheffel Road storm system to the south. Should the inlet be clogged, the resulting runoff will continue east via the neighboring curb and gutter.

6.0 PROPOSED HYDROLOGY

This preliminary drainage report is presented in order to determine the adequacy of the existing drainage facilities based upon the anticipated development. This report is associated with a preliminary plan amendment, which triggered the need for this drainage analysis. This development is in the concept stage and as such no site work, grading or drainage and utility installation is to occur at this time. The drainage report will be required to be updated upon final layout, grading and drainage design.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm recurrence intervals, and Mile High Flood District design software (MHFD-Detention v.4.03) for pond analysis. See below for a summary runoff table and description of each design point.

The basins and design points described below are based on a preliminary concept site design. Grading and subsequent areas tributary to the detention facility are subject to change and any areas not tributary to the detention facility will be assessed for water quality treatment in adherence to County drainage criteria at the final drainage report stage.

Design Point 1 represents the flows generated by offsite basin OS1, and onsite basin E1. Flows of $Q_5=7.1$ cfs and $Q_{100}=15.7$ cfs travel via the existing private 24" RCP storm sewer to the east and discharge into the north end of the existing detention facility.

Design Point 2 represents the flows generated by onsite basin B2 ($Q_5=11.8$ cfs and $Q_{100}=26.0$ cfs). These flows sheet flow across the site, from northwest to southeast, before being discharged into the existing detention facility. No early grading is proposed with this concept design, and it is acknowledged that prior to any grading an adequate method will need to be provided for flows to discharge into the existing detention facility

Design Point 3 represents all flows reaching the existing detention facility (Basins B4, P1, DP1, and DP2) for a total flow of $Q_5=19.8$ cfs and $Q_{100}=45.8$ cfs. The existing detention facility and necessary modifications for this developed condition are described further below.

Design Point 4 is identical to DP-4 in the existing condition and represents flows ($Q_5=4.7$ cfs and $Q_{100}=10.3$ cfs) from offsite basin D16 which discharge on to the southwest corner of the Windermere property.

Design Point 4A represents flows from offsite DP4 and onsite basin B4 ($Q_5=5.0$ cfs and

Q₁₀₀=11.7cfs) reaching the intersection of N. Carefree Circle and Marksheffel Road. In the developed condition, it is proposed that the roadside ditch be continued to capture flows that are not able to be captured by the detention facility due to grading restraints. This swale would allow flows to continue to the east to be captured by the existing Type D area inlet at the intersection of N. Carefree Cir. and Marksheffel Road. As the grading for the site is refined, the area tributary to the detention facility will be maximized to the extent possible given the site grading constraints. Appropriate erosion control measures will be provided at the terminus of the swale to aid in erosion and scour mitigation.

Rational Method Developed Runoff Summary

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1		3.82	7.0	15.5
OS2		0.16	0.3	0.6
E1		0.03	0.2	0.3
	1	3.85	7.1	15.7
B2	2	6.63	11.8	26.0
E3		1.10	0.8	4.5
	3	11.74	19.4	44.8
D16	4	2.73	4.7	10.3
B4		0.93	1.2	3.4
	4A	3.66	5.0	11.7
E5	5	0.63	0.4	2.4
EXR		0.53	2.4	4.4
	S	4.82	7.7	25.3
NC2	19	1.61	6.4	12.2
	J1	6.43	10.7	23.6
NC1		0.43	1.9	3.4
	20	6.86	11.8	25.7

Design Point S is located at the same existing public area inlet as DPS in the existing condition. In the developed condition flows reaching this point, from DP4A, DP5 and Basin EXR in addition to the pond release rate will equal Q₅=7.7 cfs and Q₁₀₀=25.3 cfs. Flows exit this existing public area inlet by existing public 24" RCP to the south.

Design Point 19 consists of runoff from off-site basin NC-2 with a flow of Q₅= 6.4cfs and Q₁₀₀=12.2 cfs). An existing public 15' Type R at-grade curb inlet just west of the intersection of N. Carefree Circle and Marksheffel Road intercepts a portion of this runoff (Q₅=4.8 cfs and Q₁₀₀=8.1 cfs) and discharges to the east via existing public 18" RCP storm sewer.

Design Point J1 is located at the existing public manhole on the north side of N. Carefree Circle and represents the combining of flows from DP-19 and DP-S. Flows of Q₅=10.7 cfs

and $Q_{100}=23.6$ cfs continue to the south via the existing public 30" RCP towards DP-20.

Design Point 20 consists of surface runoff from basin NC-1, flowby from the at-grade inlet at DP-19 and pipe flow from DP-J1. An existing public 10' Type R sump inlet intercepts all the surface runoff and combines it with the upstream flows from DP-J1 and DP-19 existing at-grade inlet capture. Total developed runoff at this location is $Q_5=11.8$ cfs and $Q_{100}=25.7$ cfs. This runoff continues within the existing Marksheffel Road storm system to the south. Should the inlet be clogged, the resulting runoff will continue east via the neighboring curb and gutter.

7.0 EXISTING/DEVELOPED COMPARISON

A comparison of flows between the existing and developed conditions indicates that developed flows exiting the site vary slightly from the existing condition, but release less at the ultimate outfall - Design Point 20.

	Existing		Developed	
DP	Q5 (cfs)	Q100 (cfs)	Q5 (cfs)	Q100 (cfs)
4A	4.8	13.6	5.0	11.7
S	6.7	18.1	7.7	25.3
19	6.4	12.2	6.4	12.2
J1	10.5	25.5	10.7	23.6
20	11.7	27.6	11.8	25.7

8.0 EXISTING DETENTION/WATER QUALITY FACILITY

As part of the overlot design for Windermere Filing No. 1, the detention pond located in the southeast corner of the property was designed as a full-spectrum detention facility to capture flows from the Windermere Filing No. 2 basins.

In order to minimize future grading within the detention facility area, the volume was based on an assumed final build-out watershed imperviousness of 68.0%, which considered Windermere Filing No. 2 (Windermere Filing No. 1 – Tract B) as potentially higher density than single-family residential. As part of the Windermere Filing 1 overlot grading, the pond was excavated to full volume and the outlet structure and associated piping installed. An interim orifice plate (assuming full developed condition within the street right-of-way, but no further development) was installed to allow for appropriate WQCV drain time. Once the design is finalized at the final drainage report stage, the orifice plate will need to be switched out to allow for discharge of the developed flows. It is anticipated based on this preliminary design that the restrictor plate will need to be raised to 7.80" above the invert of the 18" outfall pipe. No other portion of the detention facility will need to be modified.

Based on the analysis in this preliminary report, the developed condition encompasses a total of 11.74 acres that is tributary to this existing facility, with a composite imperviousness of 59% for the final fully developed condition. Required volumes are listed below.

		<i>Required Volume</i>		
	Imperviousness	WQCV	EURV	100-YR
FINAL	59%	0.23	0.84	1.28

The actual pond volume at the proposed spillway stage is 1.15 acre-feet. A concrete forebay with an energy dissipater has been installed where the flows enter the pond. The volume of the forebay was designed for 3% of the WQCV volume for the pond, as is still within that limit for this concept design condition. The flows exit the forebay through a notch, discharging into the concrete trickle channel at the bottom of the pond. The trickle channel conveys the flows to the micropool. The outlet structure then releases the flows at a reduced flow rate with the use of a plate with orifice holes, into a proposed 18" pipe with restrictor plate, discharging into an existing storm inlet at the corner of N. Carefree Circle and Marksheffel Rd, after which the flows continue to the south via the existing storm sewer system.

In accordance with El Paso County criteria, the modified Type C outlet structure with a permanent micropool will release the WQCV over a 40-hour period. Switching out of the orifice plate will ensure that the WQCV release rate remains within criteria for the final developed condition. The outlet structure will remain in place and in this preliminary stage will result in release rates of $Q_5=0.9$ cfs and $Q_{100}=9.2$ cfs. For comparison, the existing basin EX-A released flow rates of $Q_5=11.3$ cfs and $Q_{100}=28.2$ cfs.

A 27-ft wide riprap emergency spillway is located on the south side of the pond. In the event that water overtops the spillway, flow will discharge into existing area inlet at the intersection of N. Carefree Cir and Marksheffel Rd, where it is then picked up by the existing storm system.

All detention facility calculations, including excerpts for forebay volumes, micropool surface areas, outlet structures, discharge pipes and spillway design are provided in the appendix.

The pond has a 15' wide maintenance access that provides access to the pond bottom, forebay and outlet structure per ECM 3.3.3.K. A private maintenance agreement and O&M manual has been established for this pond as required by the County. Necessary modifications to this maintenance access will be provided with the final drainage report.

9.0 FOUR-STEP PROCESS

This project conforms to the City of Colorado Springs/El Paso County Four Step Process. The process focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

1. **Employ Runoff Reduction Practices:** Proposed impervious areas on this site (roofs, asphalt/sidewalk) will sheet flow across landscaped ground as much as possible to slow runoff and increase time of concentration prior to being conveyed to the proposed public streets and storm sewer system. This will minimize directly connected impervious areas within the project site.
2. **Implement BMP's that provide a Water Quality Capture Volume with slow release:** Runoff from this project will be treated through capture and slow release of the WQCV in a permanent Extended Detention Basin designed per current City of El Paso County drainage criteria.
3. **Stabilize Drainage Ways:** Flows from the detention facility are released directly into the existing storm sewer system and no stabilization will be necessary.
4. **Implement Site Specific and Other Source Control BMP's:** The site is proposed as a residential development, and as such standard household source control will be utilized in order to minimize potential pollutants entering the storm system. Example source control measures consist of: garages for storage of household chemicals, trash receptacles for individual households and in common areas for pet waste. The need for Industrial and Commercial BMP's was considered, however per ECM 1.7.2.A the need for industrial and commercial BMPs are not applicable for this project.

10.0 GEOTECHNICAL HAZARDS

In accordance with geotechnical recommendations, the project design is intended to direct runoff away from structures, and into the receiving storm sewer system and water quality/detention basins. This will be accomplished by a variety of means, i.e. curb and gutter and storm sewer. Per "Soils and Geology Study, Windermere Subdivision" by RMG, October 26, 2020 (Revised January 18, 2021), and updated with an addendum for Tract B (March 30, 2022)

11.0 FACILITY MAINTENANCE

Ownership and maintenance of all public facilities, generally located within the public right-of-way will be by El Paso County. Ownership and maintenance of all tracts and private facilities will be by the Sands Metropolitan District #4.

12.0 CONSTRUCTION COST ESTIMATE

Construction cost estimate will be provided with the Final Drainage Report.

13.0 DRAINAGE/BRIDGE FEES

Tract B was considered as an open space tract for the drainage fee calculation for Windermere Filing No. 1. Development of this tract will require payment of drainage and bridge fees associated with the proposed impervious acreage. This will be determined with the Final Drainage Report for this development as site imperviousness is confirmed.

14.0 CONCLUSIONS

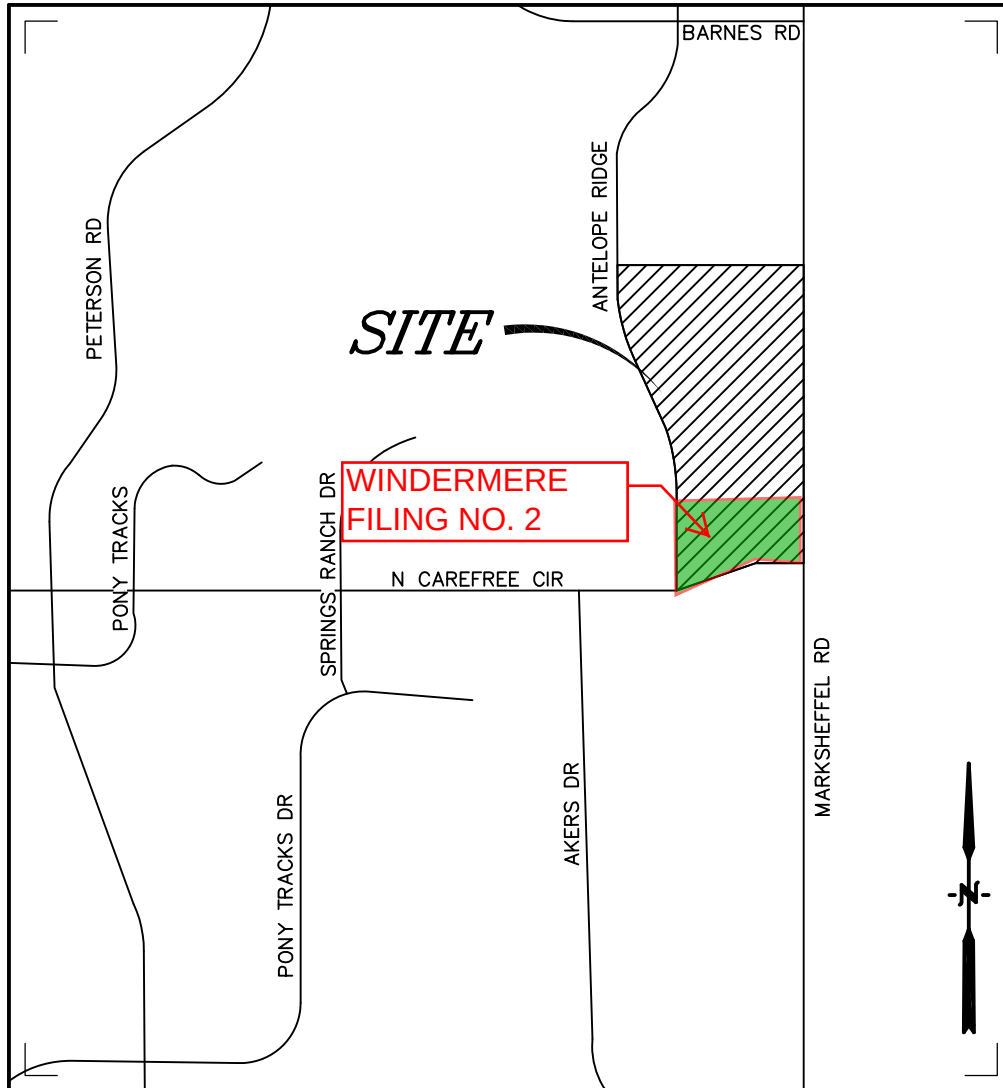
The Windermere Filing No. 2 project has been designed in accordance with El Paso County criteria. The detention facility has been designed to limit the release of storm runoff to historic conditions. This development will not negatively impact or increase flows in the downstream facilities.

15.0 REFERENCES

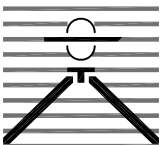
The sources of information used in the development of this study are listed below:

1. City of Colorado Springs "Drainage Criteria Manual", 2016.
2. Urban Storm Drainage Criteria Manuals, Urban Drainage and Flood Control District. June 2001, Revised October 2019.
3. Soil Survey for Colorado Springs and El Paso County, Colorado, U.S. Department of Agriculture, Soil Conservation Service, June 1980.
4. "Flood Insurance Studies for Colorado Springs and El Paso County, Colorado", prepared by the Federal Emergency Management Agency (FEMA), 2018.
5. "Soils and Geology Study, Windermere Subdivision", prepared by RMG, October 26, 2020, Revised January 18, 2021.
6. "Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1," prepared by Classic Consulting Engineers & Surveyors, October 2014.
7. "Final Drainage Report Marksheffel Road from Constitution Ave. to Dublin Rd.," by CH2M Hill, dated May 2008 and Marksheffel Road Construction Drawings by Wilson & Company.
8. "Final Drainage Report for Windermere Filing No. 1" prepared by Drexel, Barrell & Co., March 8, 2022.

APPENDIX



Vicinity Map
Not to scale



**WINDERMERE
COLORADO SPRINGS, CO
VICINITY MAP**

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:

DWG. NO.

JOB NO:

21187-00CSCV

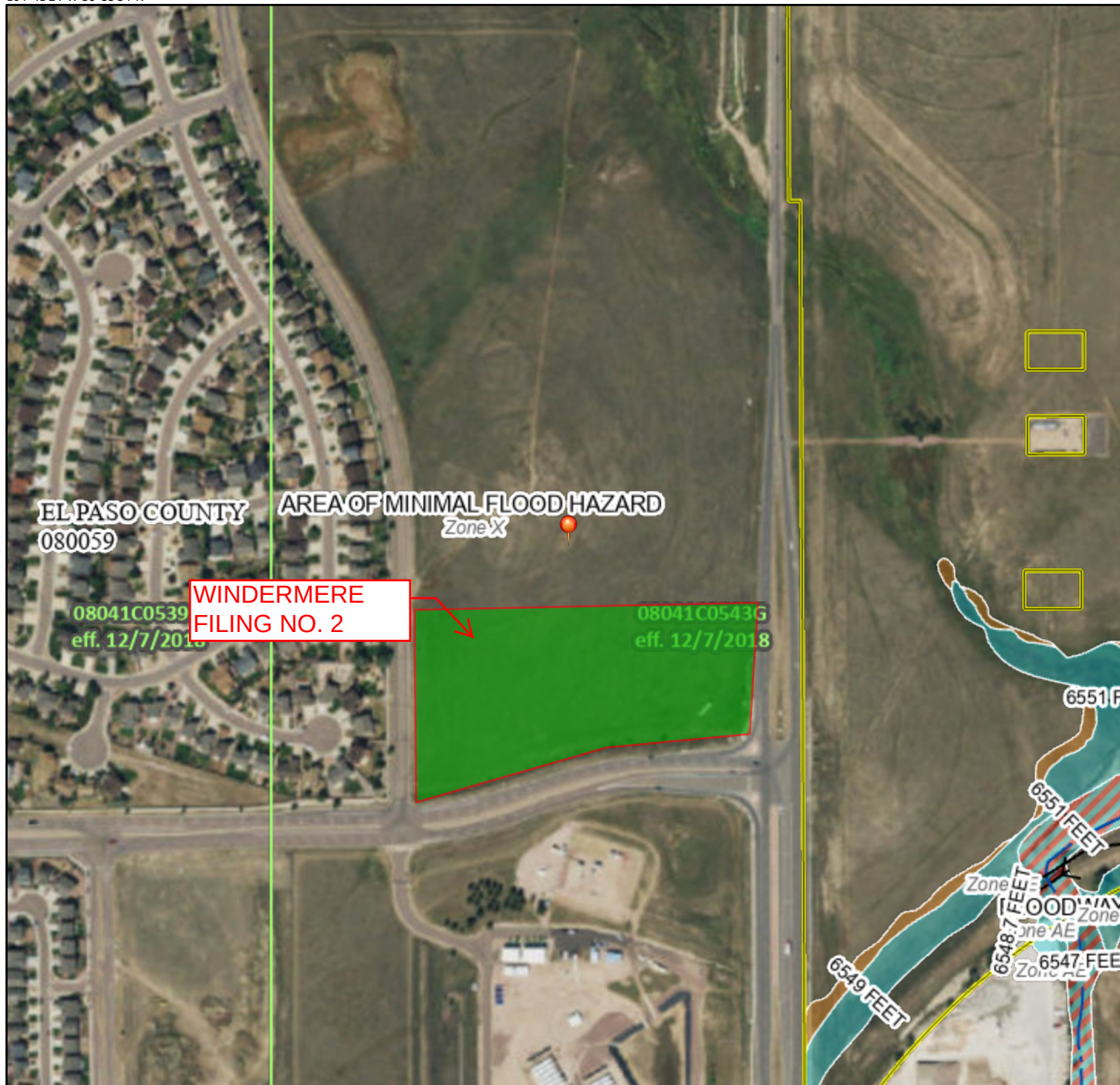
VMAP

SHEET 1 OF 1

National Flood Hazard Layer FIRMette



104°41'24"W 38°53'34"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
OTHER FEATURES		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/8/2021 at 3:46 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Hydrologic Soil Group—El Paso County Area, Colorado



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
 Survey Area Data: Version 15, Oct 10, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 15, 2011—Jun 17, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
97	Truckton sandy loam, 3 to 9 percent slopes	A	56.4	100.0%
Totals for Area of Interest			56.4	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified



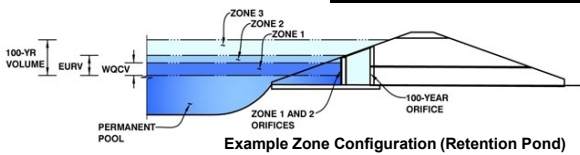
APPROVED DRAINAGE REPORT EXCERPTS

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Windermere Filing No. 1

Basin ID: South Pond - Interim Condition



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.52	0.118	Orifice Plate
Zone 2 (EURV)	3.53	0.124	Orifice Plate
Zone 3 (100-year)	4.82	0.253	Weir&Pipe (Restrict)
Total (all zones)		0.496	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 3.53 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 25.40 inches
Orifice Plate: Orifice Area per Row = N/A inches

Calculated Parameters for Plate
WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.18	2.35					
Orifice Area (sq. inches)	0.67	0.67	0.67					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = N/A N/A ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = N/A N/A inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = Not Selected Not Selected ft²
Vertical Orifice Centroid = N/A N/A feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H_o = Zone 3 Weir Not Selected ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 6.40 N/A feet
Overflow Weir Grate Slope = 3.92 N/A H:V
Horiz. Length of Weir Sides = 0.00 N/A feet
Overflow Grate Open Area % = 3.92 N/A %
Debris Clogging % = 70% N/A %
Debris Clogging % = 50% N/A %

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = Zone 3 Weir Not Selected feet
Overflow Weir Slope Length = 6.40 N/A feet
Grate Open Area / 100-yr Orifice Area = 3.92 N/A feet
Overflow Grate Open Area w/o Debris = 0.00 N/A ft²
Overflow Grate Open Area w/ Debris = 3.92 N/A ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe = Zone 3 Restrictor Not Selected ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 2.50 N/A inches
Restrictor Plate Height Above Pipe Invert = 18.00 N/A inches
Restrictor Plate Height Above Pipe Invert = 7.00 N/A inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = Zone 3 Restrictor Not Selected ft²
Outlet Orifice Centroid = 0.64 N/A feet
Half-Central Angle of Restrictor Plate on Pipe = 0.34 N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 6.94 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 27.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.55 feet
Stage at Top of Freeboard = 8.49 feet
Basin Area at Top of Freeboard = 0.58 acres
Basin Volume at Top of Freeboard = 1.80 acre-ft

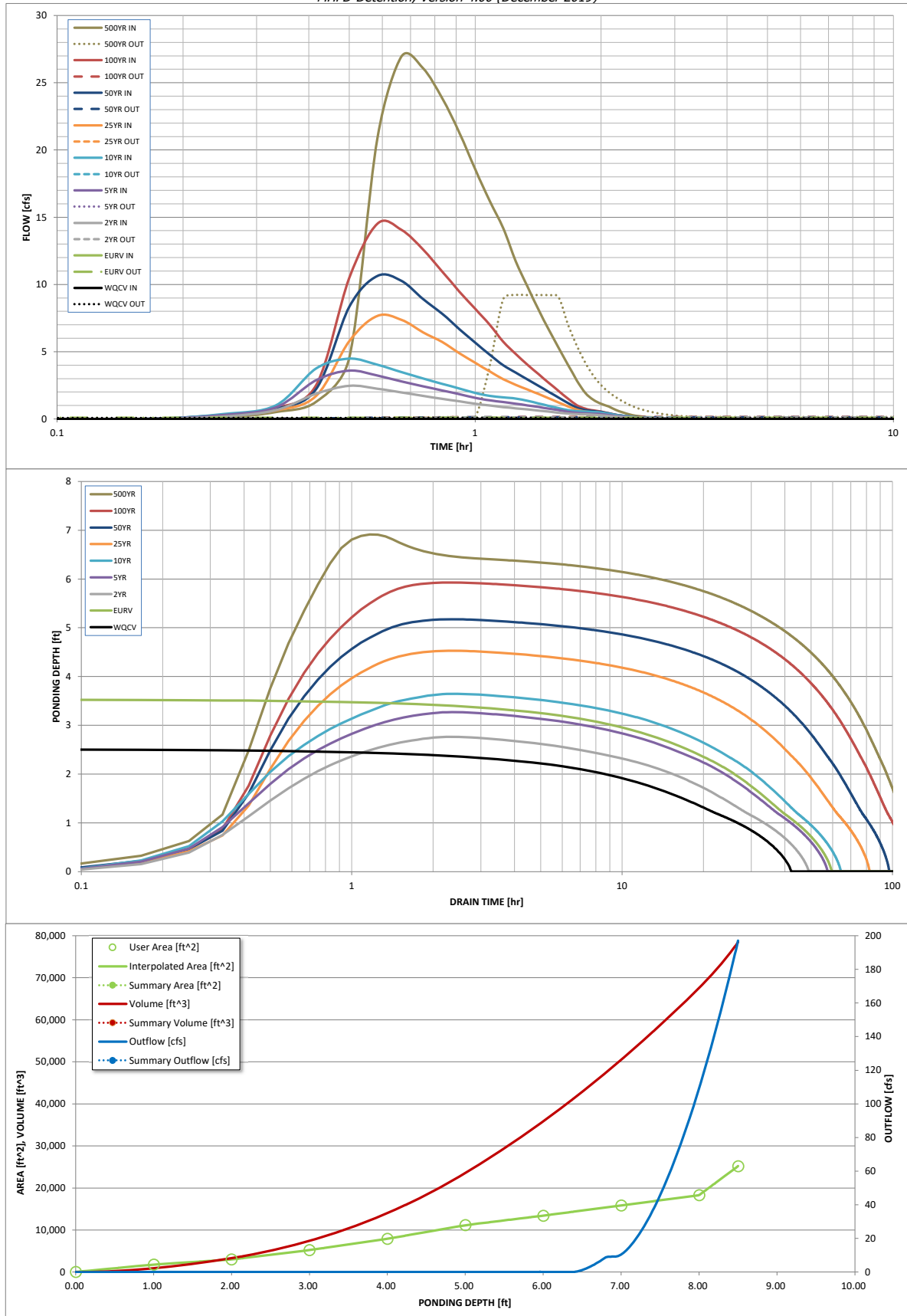
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.118	0.243	0.156	0.221	0.279	0.448	0.608	0.825	1.590
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.156	0.221	0.279	0.448	0.608	0.825	1.590
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.9	5.6	9.1	20.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.27	0.52	0.84	1.89
Peak Inflow Q (cfs) =	N/A	N/A	2.5	3.6	4.5	7.7	10.6	14.5	27.0
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	9.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.3	0.0	0.0	0.0	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	53	44	51	57	71	83	99	103
Time to Drain 99% of Inflow Volume (hours) =	40	57	47	55	61	77	91	108	116
Maximum Ponding Depth (ft) =	2.51	3.53	2.76	3.27	3.64	4.53	5.17	5.93	6.91
Area at Maximum Ponding Depth (acres) =	0.10	0.15	0.11	0.14	0.16	0.22	0.27	0.30	0.36
Maximum Volume Stored (acre-ft) =	0.118	0.243	0.144	0.204	0.260	0.427	0.585	0.799	1.127

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

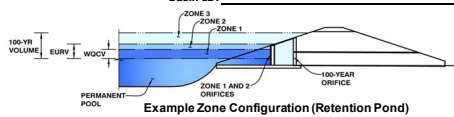
Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.10
	0:15:00	0.00	0.00	0.18	0.30	0.37	0.25	0.31	0.30	0.52
	0:20:00	0.00	0.00	0.66	0.86	1.01	0.64	0.75	0.80	1.28
	0:25:00	0.00	0.00	1.87	2.88	3.75	1.72	2.23	2.52	4.55
	0:30:00	0.00	0.00	2.47	3.59	4.48	5.79	8.34	10.48	20.89
	0:35:00	0.00	0.00	2.25	3.22	4.03	7.67	10.63	14.52	26.95
	0:40:00	0.00	0.00	1.98	2.79	3.48	7.36	10.26	14.06	26.08
	0:45:00	0.00	0.00	1.71	2.42	3.01	6.45	8.92	12.61	23.86
	0:50:00	0.00	0.00	1.50	2.13	2.62	5.72	7.82	10.97	21.29
	0:55:00	0.00	0.00	1.31	1.84	2.26	4.89	6.68	9.47	18.56
	1:00:00	0.00	0.00	1.13	1.57	1.94	4.17	5.67	8.18	16.22
	1:05:00	0.00	0.00	1.00	1.38	1.72	3.54	4.78	7.01	14.18
	1:10:00	0.00	0.00	0.89	1.26	1.61	2.96	3.99	5.75	11.72
	1:15:00	0.00	0.00	0.79	1.14	1.52	2.54	3.44	4.83	9.85
	1:20:00	0.00	0.00	0.71	1.01	1.35	2.18	2.93	4.04	8.14
	1:25:00	0.00	0.00	0.62	0.89	1.16	1.86	2.47	3.34	6.64
	1:30:00	0.00	0.00	0.54	0.77	0.97	1.53	2.02	2.69	5.30
	1:35:00	0.00	0.00	0.46	0.65	0.81	1.23	1.59	2.08	4.03
	1:40:00	0.00	0.00	0.40	0.53	0.66	0.94	1.18	1.51	2.87
	1:45:00	0.00	0.00	0.36	0.45	0.59	0.69	0.84	1.03	1.94
	1:50:00	0.00	0.00	0.35	0.42	0.55	0.56	0.66	0.76	1.43
	1:55:00	0.00	0.00	0.31	0.39	0.52	0.49	0.58	0.63	1.13
	2:00:00	0.00	0.00	0.28	0.36	0.48	0.46	0.53	0.55	0.93
	2:05:00	0.00	0.00	0.22	0.29	0.38	0.36	0.41	0.42	0.68
	2:10:00	0.00	0.00	0.18	0.23	0.30	0.28	0.32	0.31	0.49
	2:15:00	0.00	0.00	0.14	0.18	0.23	0.21	0.24	0.23	0.34
	2:20:00	0.00	0.00	0.11	0.14	0.18	0.16	0.18	0.17	0.24
	2:25:00	0.00	0.00	0.08	0.11	0.14	0.13	0.14	0.13	0.18
	2:30:00	0.00	0.00	0.06	0.08	0.10	0.09	0.11	0.10	0.14
	2:35:00	0.00	0.00	0.05	0.06	0.08	0.07	0.08	0.07	0.10
	2:40:00	0.00	0.00	0.04	0.05	0.06	0.05	0.06	0.06	0.08
	2:45:00	0.00	0.00	0.03	0.03	0.04	0.04	0.04	0.04	0.06
	2:50:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	2:55:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:05:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MHFD-Detention, Version 4.03 (May 2020)

Basin ID:



Watershed Information

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Optional User Overrides

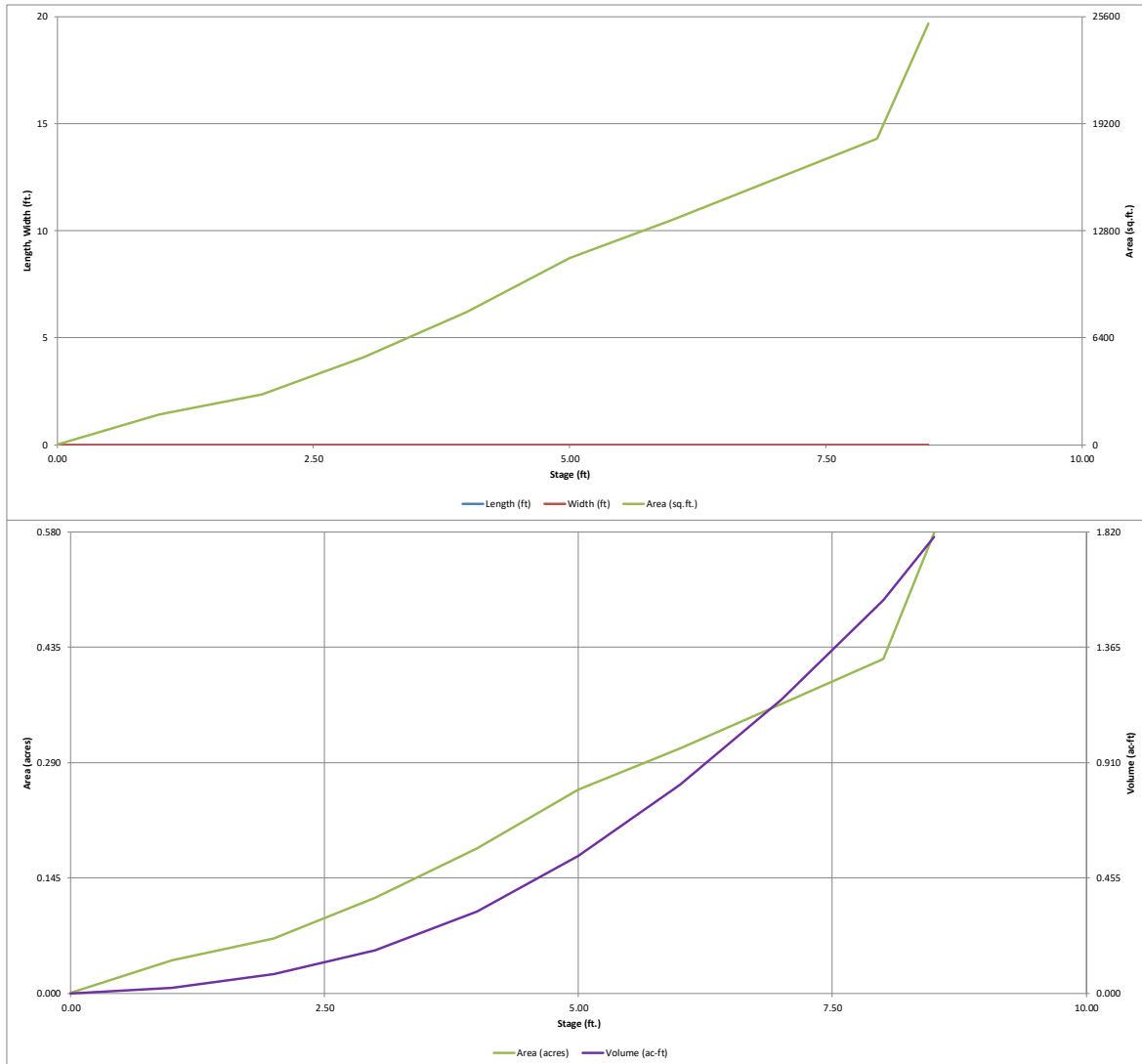
	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.49	inches

Zone 1 Volume (WQCV) =	0.242	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.689	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.442	acre-feet
Total Detention Basin Volume =	1.373	acre-feet
Initial Surge Volume (ISV) =	user	ft ³
Initial Surge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{S1})	=	user	ft ²
Surcharge Volume Length (L_{S1})	=	user	ft
Surcharge Volume Width (W_{S1})	=	user	ft
Depth of Basin Floor (H_{FLOOR})	=	user	ft
Length of Basin Floor (L_{FLOOR})	=	user	ft
Width of Basin Floor (W_{FLOOR})	=	user	ft
Area of Basin Floor (A_{FLOOR})	=	user	ft ²
Volume of Basin Floor (V_{FLOOR})	=	user	ft ³
Depth of Main Basin (H_{MAIN})	=	user	ft
Length of Main Basin (L_{MAIN})	=	user	ft
Width of Main Basin (W_{MAIN})	=	user	ft
Area of Main Basin (A_{MAIN})	=	user	ft ²
Volume of Main Basin (V_{MAIN})	=	user	ft ³
Calculated Total Basin Volume (V_{TOTAL})	=	user	acre-feet

[illegible]

WINDERMERE FILING NO. 1 FDR EXCERPT
SOUTH POND FINAL DESIGN

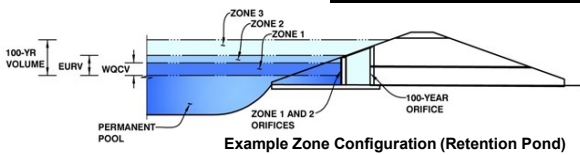


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Windermere South - FINAL

Basin ID:



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.52	0.242	Orifice Plate
Zone 2 (EURV)	6.34	0.689	Orifice Plate
Zone 3 (100-year)	7.57	0.442	Weir&Pipe (Restrict)
Total (all zones)		1.373	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 6.34 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 25.40 inches
Orifice Plate: Orifice Area per Row = N/A inches

Calculated Parameters for Plate
WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.11	4.23					
Orifice Area (sq. inches)	1.24	1.24	1.24					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = N/A N/A ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = N/A N/A inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = Not Selected Not Selected ft²
Vertical Orifice Centroid = N/A N/A feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H_o = Zone 3 Weir Not Selected ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 3.92 N/A feet
Overflow Weir Grate Slope = 0.00 N/A H:V
Horiz. Length of Weir Sides = 3.92 N/A feet
Overflow Grate Open Area % = 70% N/A %, grate open area/total area
Debris Clogging % = 50% N/A %

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = Zone 3 Weir Not Selected feet
Overflow Weir Slope Length = 3.92 N/A feet
Grate Open Area / 100-yr Orifice Area = 16.92 N/A
Overflow Grate Open Area w/o Debris = 10.76 N/A ft²
Overflow Grate Open Area w/ Debris = 5.38 N/A ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe = Zone 3 Restrictor Not Selected ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 18.00 N/A inches
Restrictor Plate Height Above Pipe Invert = 7.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = Zone 3 Restrictor Not Selected ft²
Outlet Orifice Centroid = 0.34 N/A feet
Half-Central Angle of Restrictor Plate on Pipe = 1.35 N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 6.94 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 27.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.55 feet
Stage at Top of Freeboard = 8.49 feet
Basin Area at Top of Freeboard = 0.58 acres
Basin Volume at Top of Freeboard = 1.80 acre-ft

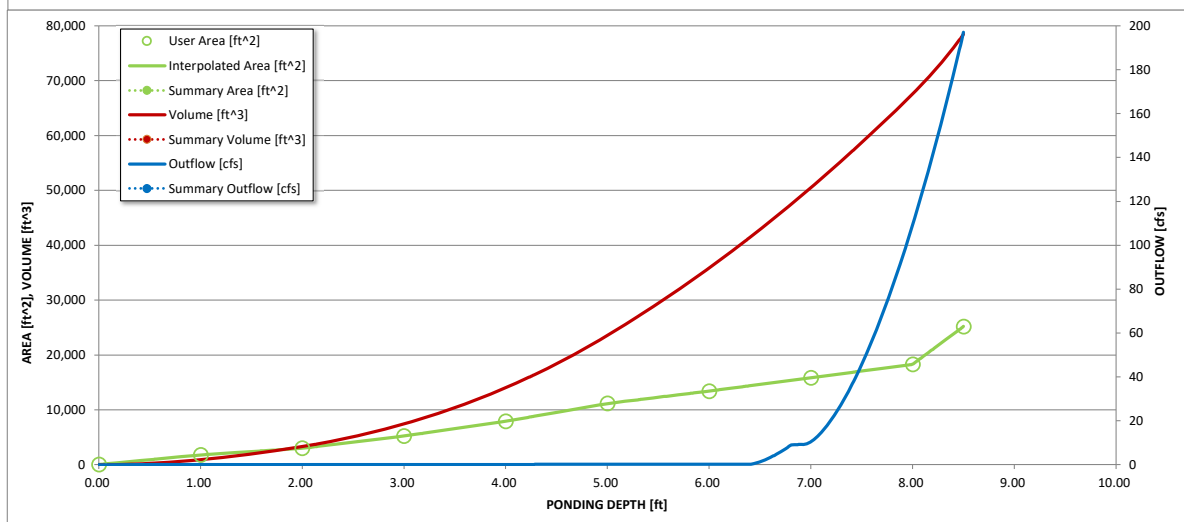
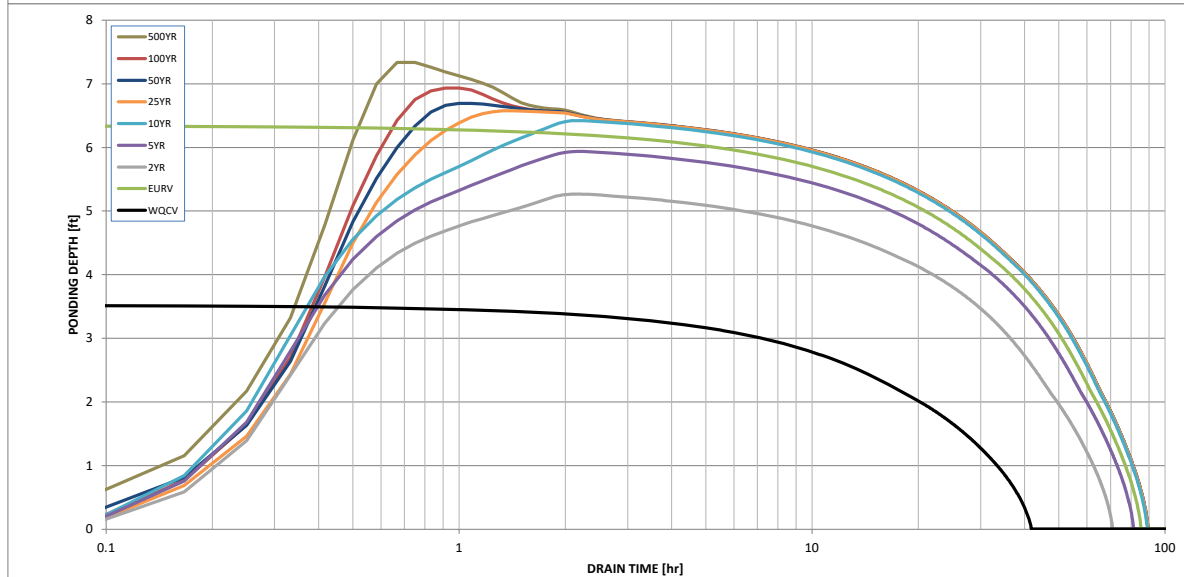
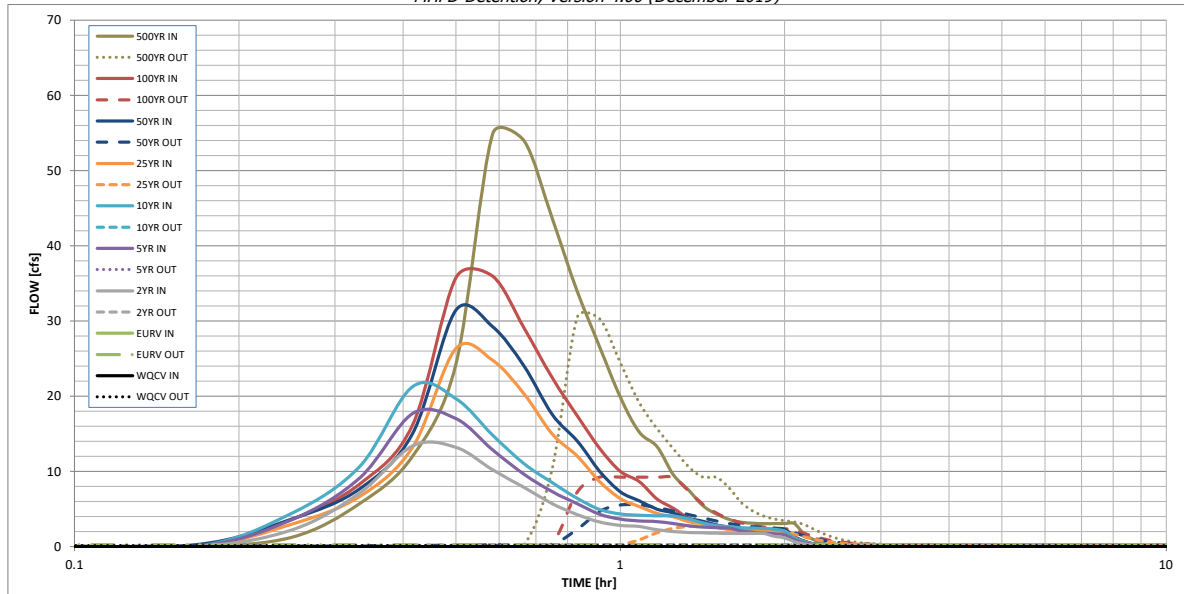
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.242	0.931	0.641	0.838	0.996	1.198	1.395	1.633	2.459
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.641	0.838	0.996	1.198	1.395	1.633	2.459
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.9	5.6	9.1	20.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.27	0.52	0.84	1.89
Peak Inflow Q (cfs) =	N/A	N/A	13.4	17.7	21.3	26.3	31.4	35.9	54.9
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.3	2.7	5.5	9.2	30.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.1	0.9	1.0	1.0	1.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.2	0.5	0.8	0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	75	63	72	78	77	76	74	69
Time to Drain 99% of Inflow Volume (hours) =	40	81	68	77	84	84	83	83	80
Maximum Ponding Depth (ft) =	3.53	6.34	5.26	5.94	6.42	6.57	6.69	6.93	7.33
Area at Maximum Ponding Depth (acres) =	0.15	0.33	0.27	0.30	0.33	0.34	0.35	0.36	0.38
Maximum Volume Stored (acre-ft) =	0.243	0.931	0.609	0.802	0.954	1.008	1.046	1.134	1.282

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



DETENTION BASIN OUTLET STRUCTURE

Outflow Hydrograph Workbook Filename: _____

WINDERMERE FILING NO. 1 FDR EXCERPT
SOUTH POND FINAL DESIGN

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.02	1.24
	0:15:00	0.00	0.00	2.20	3.58	4.43	2.98	3.64	3.62	5.72
	0:20:00	0.00	0.00	7.15	9.15	10.68	6.68	7.69	8.35	12.02
	0:25:00	0.00	0.00	13.38	17.69	21.29	13.23	15.05	16.20	24.26
	0:30:00	0.00	0.00	13.20	16.99	19.67	26.35	31.45	35.75	54.89
	0:35:00	0.00	0.00	10.18	12.85	14.80	24.76	29.25	35.94	53.97
	0:40:00	0.00	0.00	7.86	9.61	11.02	20.31	24.00	29.05	43.65
	0:45:00	0.00	0.00	5.71	7.29	8.49	14.97	17.57	22.45	33.95
	0:50:00	0.00	0.00	4.27	5.70	6.40	12.02	14.05	17.39	26.56
	0:55:00	0.00	0.00	3.25	4.28	4.93	8.64	9.99	13.05	19.85
	1:00:00	0.00	0.00	2.81	3.64	4.33	6.38	7.27	9.99	15.21
	1:05:00	0.00	0.00	2.65	3.41	4.15	5.32	6.06	8.64	13.31
	1:10:00	0.00	0.00	2.23	3.33	4.09	4.41	4.99	6.33	9.55
	1:15:00	0.00	0.00	2.01	3.06	4.06	3.95	4.46	5.08	7.52
	1:20:00	0.00	0.00	1.88	2.76	3.68	3.31	3.73	3.74	5.42
	1:25:00	0.00	0.00	1.80	2.60	3.14	3.00	3.37	3.03	4.32
	1:30:00	0.00	0.00	1.76	2.50	2.81	2.55	2.87	2.57	3.60
	1:35:00	0.00	0.00	1.73	2.44	2.62	2.30	2.58	2.32	3.22
	1:40:00	0.00	0.00	1.73	2.08	2.51	2.16	2.42	2.24	3.10
	1:45:00	0.00	0.00	1.73	1.88	2.44	2.08	2.34	2.19	3.03
	1:50:00	0.00	0.00	1.73	1.76	2.41	2.05	2.30	2.19	3.03
	1:55:00	0.00	0.00	1.36	1.70	2.30	2.03	2.28	2.19	3.03
	2:00:00	0.00	0.00	1.15	1.57	2.02	2.03	2.28	2.19	3.03
	2:05:00	0.00	0.00	0.65	0.89	1.16	1.16	1.30	1.25	1.73
	2:10:00	0.00	0.00	0.36	0.50	0.65	0.66	0.74	0.71	0.98
	2:15:00	0.00	0.00	0.18	0.27	0.34	0.35	0.39	0.37	0.51
	2:20:00	0.00	0.00	0.08	0.13	0.16	0.18	0.20	0.19	0.26
	2:25:00	0.00	0.00	0.03	0.05	0.05	0.06	0.07	0.07	0.09
	2:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

North Pond (North Forebay)

FOREBAY VOLUME

Req'd V=3% x WQCV

Ex DP 24 Impervious Area
0.34 79.05

WQCV= 1.0826 ac-ft

V= 0.0325 ac-ft

Actual V 0.0409 ac-ft

FOREBAY RELEASE NOTCH WIDTH

5-YR NOTCH

$Q=CLH^{3/2}$

$Q_{100}= 111.3$ cfs

2% of Q= 2.23 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 10 in
3 in min.

FOREBAY RELEASE NOTCH WIDTH

100-YR NOTCH

$Q=CLH^{3/2}$

$Q_{100}= 199.7$ cfs

2% of Q= 3.99 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 18 in
3 in min.

North Pond (South Forebay)

FOREBAY VOLUME

Req'd V=3% x WQCV

DPM1 Impervious Area
0.65 40.15

WQCV= 0.8503 ac-ft

V= 0.0255 ac-ft

Actual V 0.0310 ac-ft

FOREBAY RELEASE NOTCH WIDTH

5-YR NOTCH

$Q=CLH^{3/2}$

$Q_{100}= 54.8$ cfs

2% of Q= 1.10 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 5 in
3 in min.

FOREBAY RELEASE NOTCH WIDTH

100-YR NOTCH

$Q=CLH^{3/2}$

$Q_{100}= 119.4$ cfs

2% of Q= 2.39 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 11 in
3 in min.

South Pond (Forebay)

FOREBAY VOLUME

Req'd V=3% x WQCV

From Detention spreadsheet

WQCV= 0.052 ac-ft

V= 0.0016 ac-ft

Actual V 0.0040 ac-ft

FOREBAY RELEASE NOTCH WIDTH

$Q=CLH^{3/2}$

$Q_{100}= 17.9$ cfs

2% of Q= 0.36 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 2 in
3 in min.

Figure 13-12c. Emergency Spillway Protection

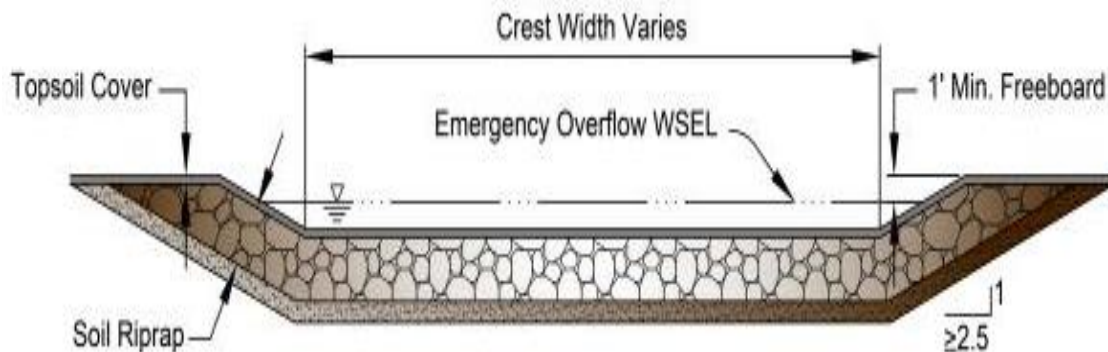
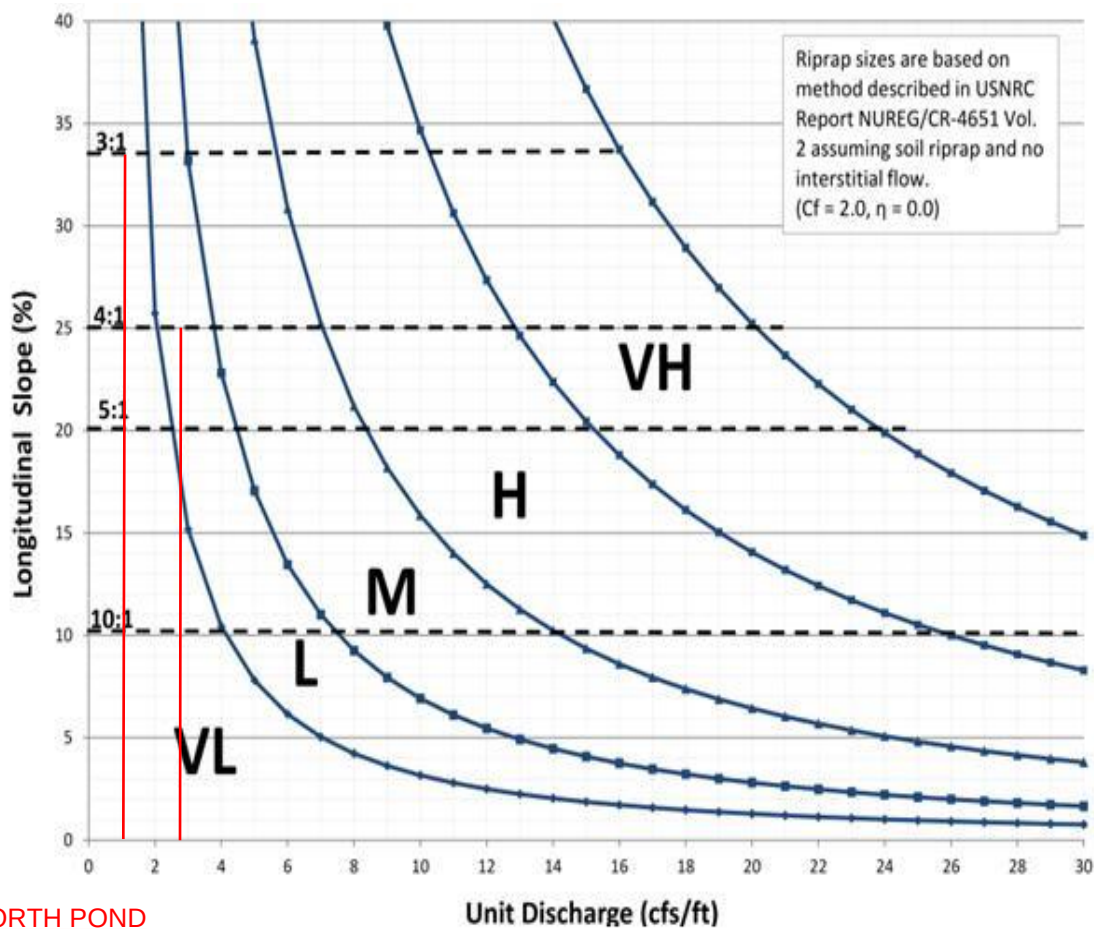


Figure 13-12d. Riprap Types for Emergency Spillway Protection



NORTH POND

UNIT DISCHARGE= $194.1/70=2.7\text{cfs}$

SOUTH POND

UNIT DISCHARGE= $35.9/27= 1.3\text{cfs}$

HYDROLOGIC ANALYSIS

PROJECT INFORMATION									
PROJECT:	Windermere 2								
PROJECT NO:	21187-03								
DESIGN BY:	CGH								
REV. BY:	KGV								
AGENCY:	El Paso County								
REPORT TYPE:	Final								
DATE:	9/5/2024								
Soil Type: A									
					C2*	C5*	C10*	C100*	% IMPERV
Open Space						0.15		0.50	0
Residential (<1/8 acre)						0.45		0.59	65
Asphalt/Sidewalk						0.90		0.96	100
EXISTING									
SUB-BASIN	SURFACE DESIGNATION		AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV	
			ACRE	C2	C5	C10	C100		
OS1	Open Space		0.00		0.15		0.50	0	
	Residential (<1/8 acre)		3.82		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.45		0.59	65%	
TOTAL OS1			3.82						
OS2	Open Space		0.00		0.15		0.50	0	
	Residential (<1/8 acre)		0.16		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.45		0.59	65%	
TOTAL OS2			0.16						
E1	Open Space		0.00		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.03		0.90		0.96	100	
	WEIGHTED AVERAGE				0.90		0.96	100%	
TOTAL E1			0.03						
E2	Open Space		5.70		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.15		0.50	0%	
TOTAL E2			5.70						
E3	Open Space		1.10		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.15		0.50	0%	
TOTAL E3			1.10						
E4	Open Space		1.86		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.15		0.50	0%	
TOTAL E4			1.86						
E5	Open Space		0.63		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.15		0.50	0%	
TOTAL E5			0.63						
NC2	Open Space		0.27		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	

	Asphalt/Sidewalk	1.34		0.90		0.96	100
	WEIGHTED AVERAGE			0.77		0.88	83%
TOTAL NC2		1.61					
NC1	Open Space	0.03		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.40		0.90		0.96	100
	WEIGHTED AVERAGE			0.85		0.93	93%
TOTAL NC1		0.43					
D16	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	2.73		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL D16		2.73					
EXR	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.53		0.90		0.96	100
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL EXR		0.53					

PROJECT INFORMATION

PROJECT: Windermere 2
 PROJECT NO: 21187-03
 DESIGN BY: CGH
 REV. BY: KGV
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/5/2024



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t _i)					TRAVEL TIME (t _t)					PIPE TRAVEL TIME (t _p)				TIME OF CONC. t _c		FINAL t _c
BASIN	DESIGN PT:	C _s	C ₁₀₀	AREA		LENGTH	HT	SLOPE	t _i	LENGTH	HT	SLOPE	VEL.	t _t	LENGTH	SLOPE	VEL.	t _t	COMP.	MINIMUM	
				Ac		Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t _c	t _c	Min
OS1		0.45	0.59	3.82	1.72	2.25	35	1	3.5	4.7	885	30	3.4	2.8	5.3				10.1	5	10.1
OS2		0.45	0.59	0.16	0.07	0.10	50	2	4.0	5.4	725	20	2.8	2.5	4.8				10.2	5	10.2
E1		0.90	0.96	0.03	0.03	0.03	20	0	2.0	1.3					30	2.0	8.3	0.1	1.4	5	5.0
OS1+E1	1	0.45	0.59	3.85	1.75	2.29	From OS1			10.1					30	2.0	8.3	0.1	10.1	5	10.1
E2	2	0.15	0.50	5.70	0.85	2.85	100	5	5.3	10.2	825	21	2.5	2.4	5.8				15.9	5	15.9
E3		0.15	0.50	1.10	0.16	0.55	85	24	28.5	5.4	75	4	5.3	3.5	0.4				5.7	5	5.7
DP1+DP2+OS2+E3	3	0.26	0.53	10.81	2.84	5.78	From DP2			15.9	75	4	5.3	3.5	0.4				16.3	5	16.3
D16	4	0.45	0.59	2.73	1.23	1.61	200	10	5.0	10.1	350	12	3.5	2.8	2.1				12.1	5	12.1
E4		0.15	0.50	1.86	0.28	0.93	100	5	5.5	10.1	775	18	2.3	2.3	5.7				15.7	5	15.7
DP4+E4	4A	0.33	0.55	4.59	1.51	2.54	From DP4			12.1	775	18	2.3	2.3	5.7				17.8	5	17.8
E5	5	0.15	0.50	0.63	0.09	0.32	60	12	20.0	5.1	455	15	3.3	2.7	2.8				7.9	5	7.9
EXR		0.90	0.96	0.53	0.48	0.51	20	2	10.0	0.8	320	6	2.0	2.1	2.5				3.3	5	5.0
DP4A+DP5+EXR	S	0.36	0.59	5.75	2.08	3.36	From DP4A			17.8	20	0.2	1.0	1.5	0.2				18.0	5	18.0
NC2	19	0.77	0.88	1.61	1.25	1.42					625	25	4.0	3.0	3.5				3.5	5	5.0
DPS+DP19	J1	0.45	0.65	7.36	3.33	4.79	From DPS			18.0					30	2	9.6	0.1	18.1	5	18.1
NC1		0.85	0.93	0.43	0.36	0.40	45	1	2.2	2.4	185	4	2.2	2.2	1.4				3.8	5	5.0
DPJ1+NC1	20	0.47	0.67	7.79	3.69	5.18	From DPJ1			18.1					45	2	9.6	0.1	18.1	5	18.1

PROJECT INFORMATION

PROJECT: Windermere 2
 PROJECT NO: 21187-03
 DESIGN BY: CGH
 REV. BY: KGV
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/5/2024



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING	RUNOFF		5 YR STORM		P1=		1.50
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1		3.82	0.45	10.1	1.72	4.09	7.0
OS2		0.16	0.45	10.2	0.07	4.06	0.3
E1		0.03	0.90	5.0	0.03	5.10	0.2
	1	3.85	0.45	10.1	1.75	4.08	7.1
E2	2	5.70	0.15	15.9	0.85	3.37	2.9
E3		1.10	0.15	5.7	0.16	4.92	0.8
	3	10.81	0.26	16.3	2.84	3.33	9.5
Interim Design Pond Outfall							0.1
D16	4	2.73	0.45	12.1	1.23	3.80	4.7
E4		1.86	0.15	15.7	0.28	3.39	0.9
	4A	4.59	0.33	17.8	1.51	3.20	4.8
E5	5	0.63	0.15	7.9	0.09	4.47	0.4
EXR		0.53	0.90	5.0	0.48	5.10	2.4
	S	5.75	0.36	18.0	2.08	3.18	6.7
NC2	19	1.61	0.77	5.0	1.25	5.10	6.4
	J1	7.36	0.45	18.1	3.33	3.17	10.5
NC1		0.43	0.85	5.0	0.36	5.10	1.9
	20	7.79	0.47	18.1	3.69	3.16	11.7

PROJECT INFORMATION

PROJECT: Windermere 2
 PROJECT NO: 21187-03
 DESIGN BY: CGH
 REV. BY: KGV
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/5/2024



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING RUNOFF 100 YR STORM P1= 2.52

BASIN (S)	DESIGN POINT	AREA (AC)	DIRECT RUNOFF		C * A	I (IN/HR)	Q (CFS)
			RUNOFF COEFF	t _c (MIN)			
OS1		3.82	0.59	10.1	2.25	6.87	15.5
OS2		0.16	0.59	10.2	0.10	6.83	0.6
E1		0.03	0.96	5.0	0.03	8.58	0.3
	1	3.85	0.59	10.1	2.29	6.86	15.7
E2	2	5.70	0.50	15.9	2.85	5.66	16.1
E3		1.10	0.50	5.7	0.55	8.27	4.5
	3	10.81	0.53	16.3	5.78	5.60	32.3
Interim Design Pond Outfall							0.1
D16	4	2.73	0.59	12.1	1.61	6.38	10.3
E4		1.86	0.50	15.7	0.93	5.69	5.3
	4A	4.59	0.55	17.8	2.54	5.37	13.6
E5	5	0.63	0.50	7.9	0.32	7.51	2.4
EXR		0.53	0.96	5.0	0.51	8.58	4.4
	S	5.75	0.59	18.0	3.36	5.34	18.1
NC2	19	1.61	0.88	5.0	1.42	8.58	12.2
	J1	7.36	0.65	18.1	4.79	5.33	25.5
NC1		0.43	0.93	5.0	0.40	8.58	3.4
	20	7.79	0.67	18.1	5.18	5.32	27.6

PROJECT INFORMATION									
PROJECT:	Windermere 2								
PROJECT NO:	21187-03								
DESIGN BY:	CGH								
REV. BY:	KGV								
AGENCY:	El Paso County								
REPORT TYPE:	Final								
DATE:	9/5/2024								
Soil Type: A									
					C2*	C5*	C10*	C100*	% IMPERV
Open Space						0.15		0.50	0
Residential (<1/8 acre)						0.45		0.59	65
Asphalt/Sidewalk						0.90		0.96	100
DEVELOPED									
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV		
		ACRE		C2	C5	C10	C100		
OS1	Open Space	0.00			0.15		0.50		0
	Residential (<1/8 acre)	3.82			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.45		0.59		65%
TOTAL OS1		3.82							
OS2	Open Space	0.00			0.15		0.50		0
	Residential (<1/8 acre)	0.16			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.45		0.59		65%
TOTAL OS2		0.16							
E1	Open Space	0.00			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65
	Asphalt/Sidewalk	0.03			0.90		0.96		100
	WEIGHTED AVERAGE				0.90		0.96		100%
TOTAL E1		0.03							
B2	Open Space	0.00			0.15		0.50		0
	Residential (<1/8 acre)	6.63			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.45		0.59		65%
TOTAL B2		6.63							
E3	Open Space	1.10			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.15		0.50		0%
TOTAL E3		1.10							
B4	Open Space	0.68			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65
	Asphalt/Sidewalk	0.25			0.90		0.96		100
	WEIGHTED AVERAGE				0.35		0.62		27%
TOTAL B4		0.93							
E5	Open Space	0.63			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.15		0.50		0%
TOTAL E5		0.63							
NC2	Open Space	0.27			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65

	Asphalt/Sidewalk	1.34		0.90		0.96	100
	WEIGHTED AVERAGE			0.77		0.88	83%
TOTAL NC2		1.61					
NC1	Open Space	0.03		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.40		0.90		0.96	100
	WEIGHTED AVERAGE			0.85		0.93	93%
TOTAL NC1		0.43					
D16	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	2.73		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL D16		2.73					
EXR	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.53		0.90		0.96	100
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL EXR		0.53					
Pond Tributary (OS1, OS2, E1, B2, E3)		11.74		0.42		0.58	59%

PROJECT INFORMATION

PROJECT: Windermere 2
 PROJECT NO: 21187-03
 DESIGN BY: CGH
 REV. BY: KGV
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/5/2024



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t _i)					TRAVEL TIME (t _t)					PIPE TRAVEL TIME (t _p)				TIME OF CONC. t _c		FINAL t _c
BASIN	DESIGN PT:	C _s	C ₁₀₀	AREA		LENGTH	HT	SLOPE	t _i	LENGTH	HT	SLOPE	VEL.	t _t	LENGTH	SLOPE	VEL.	t _t	COMP.	MINIMUM	
				Ac		Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t _c	t _c	Min
OS1		0.45	0.59	3.82	1.72	2.25	35	1	3.5	4.7	885	30	3.4	2.8	5.3				10.1	5	10.1
OS2		0.45	0.59	0.16	0.07	0.10	50	2	4.0	5.4	725	20	2.8	2.5	4.8				10.2	5	10.2
E1		0.90	0.96	0.03	0.03	0.03	20	0	2.0	1.3					30	2.0	8.3	0.1	1.4	5	5.0
OS1+E1	1	0.45	0.59	3.85	1.75	2.29	From OS1			10.1					30	2.0	8.3	0.1	10.1	5	10.1
B2	2	0.45	0.59	6.63	2.98	3.91	100	5	5.3	7.0	650	21	3.2	2.7	4.0				11.0	5	11.0
E3		0.15	0.50	1.10	0.16	0.55	85	24	28.5	5.4	75	4	5.3	3.5	0.4				5.7	5	5.7
DP1+DP2+OS2+E3	3	0.42	0.58	11.74	4.97	6.84	From DP2			11.0	75	4	5.3	3.5	0.4				11.4	5	11.4
D16	4	0.45	0.59	2.73	1.23	1.61	200	10	5.0	10.1	350	12	3.5	2.8	2.1				12.1	5	12.1
B4		0.35	0.62	0.93	0.33	0.58	100	5	5.5	7.9	830	18	2.2	2.2	6.3				14.2	5	14.2
DP4+E4	4A	0.43	0.60	3.66	1.55	2.19	From DP4			12.1	775	18	2.3	2.3	5.7				17.8	5	17.8
E5	5	0.15	0.50	0.63	0.09	0.32	60	12	20.0	5.1	455	15	3.3	2.7	2.8				7.9	5	7.9
EXR		0.90	0.96	0.53	0.48	0.51	20	2	10.0	0.8	320	6	2.0	2.1	2.5				3.3	5	5.0
DP4A+DP5+EXR	S	0.44	0.63	4.82	2.13	3.01	From DP4A			17.8	20	0.2	1.0	1.5	0.2				18.0	5	18.0
NC2	19	0.77	0.88	1.61	1.25	1.42					625	25	4.0	3.0	3.5				3.5	5	5.0
DPS+DP19	J1	0.52	0.69	6.43	3.37	4.44	From DPS			18.0					30	2	9.6	0.1	18.1	5	18.1
NC1		0.85	0.93	0.43	0.36	0.40	45	1	2.2	2.4	185	4	2.2	2.2	1.4				3.8	5	5.0
DPJ1+NC1	20	0.54	0.70	6.86	3.74	4.83	From DPJ1			18.1					45	2	9.6	0.1	18.1	5	18.1

PROJECT INFORMATION

PROJECT: Windermere 2
 PROJECT NO: 21187-03
 DESIGN BY: CGH
 REV. BY: KGV
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/5/2024



Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED	RUNOFF		5 YR STORM		P1=		1.50
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1		3.82	0.45	10.1	1.72	4.09	7.0
OS2		0.16	0.45	10.2	0.07	4.06	0.3
E1		0.03	0.90	5.0	0.03	5.10	0.2
	1	3.85	0.45	10.1	1.75	4.08	7.1
B2	2	6.63	0.45	11.0	2.98	3.95	11.8
E3		1.10	0.15	5.7	0.16	4.92	0.8
	3	11.74	0.42	11.4	4.97	3.90	19.4
Pond Outfall							0.9
D16	4	2.73	0.45	12.1	1.23	3.80	4.7
B4		0.93	0.35	14.2	0.33	3.55	1.2
	4A	3.66	0.43	17.8	1.55	3.20	5.0
E5	5	0.63	0.15	7.9	0.09	4.47	0.4
EXR		0.53	0.90	5.0	0.48	5.10	2.4
	S	4.82	0.44	18.0	2.13	3.18	7.7
NC2	19	1.61	0.77	5.0	1.25	5.10	6.4
	J1	6.43	0.52	18.1	3.37	3.17	10.7
NC1		0.43	0.85	5.0	0.36	5.10	1.9
	20	6.86	0.54	18.1	3.74	3.16	11.8

PROJECT INFORMATION

PROJECT: Windermere 2
 PROJECT NO: 21187-03
 DESIGN BY: CGH
 REV. BY: KGV
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/5/2024



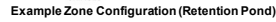
Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED	RUNOFF		100 YR STORM		P1=		2.52
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1		3.82	0.59	10.1	2.25	6.87	15.5
OS2		0.16	0.59	10.2	0.10	6.83	0.6
E1		0.03	0.96	5.0	0.03	8.58	0.3
	1	3.85	0.59	10.1	2.29	6.86	15.7
B2	2	6.63	0.59	11.0	3.91	6.64	26.0
E3		1.10	0.50	5.7	0.55	8.27	4.5
	3	11.74	0.58	11.4	6.84	6.56	44.8
Pond Outfall							9.2
D16	4	2.73	0.59	12.1	1.61	6.38	10.3
B4		0.93	0.62	14.2	0.58	5.96	3.4
	4A	3.66	0.60	17.8	2.19	5.37	11.7
E5	5	0.63	0.50	7.9	0.32	7.51	2.4
EXR		0.53	0.96	5.0	0.51	8.58	4.4
	S	4.82	0.63	18.0	3.01	5.34	25.3
NC2	19	1.61	0.88	5.0	1.42	8.58	12.2
	J1	6.43	0.69	18.1	4.44	5.33	23.6
NC1		0.43	0.93	5.0	0.40	8.58	3.4
	20	6.86	0.70	18.1	4.83	5.32	25.7

HYDRAULIC ANALYSIS

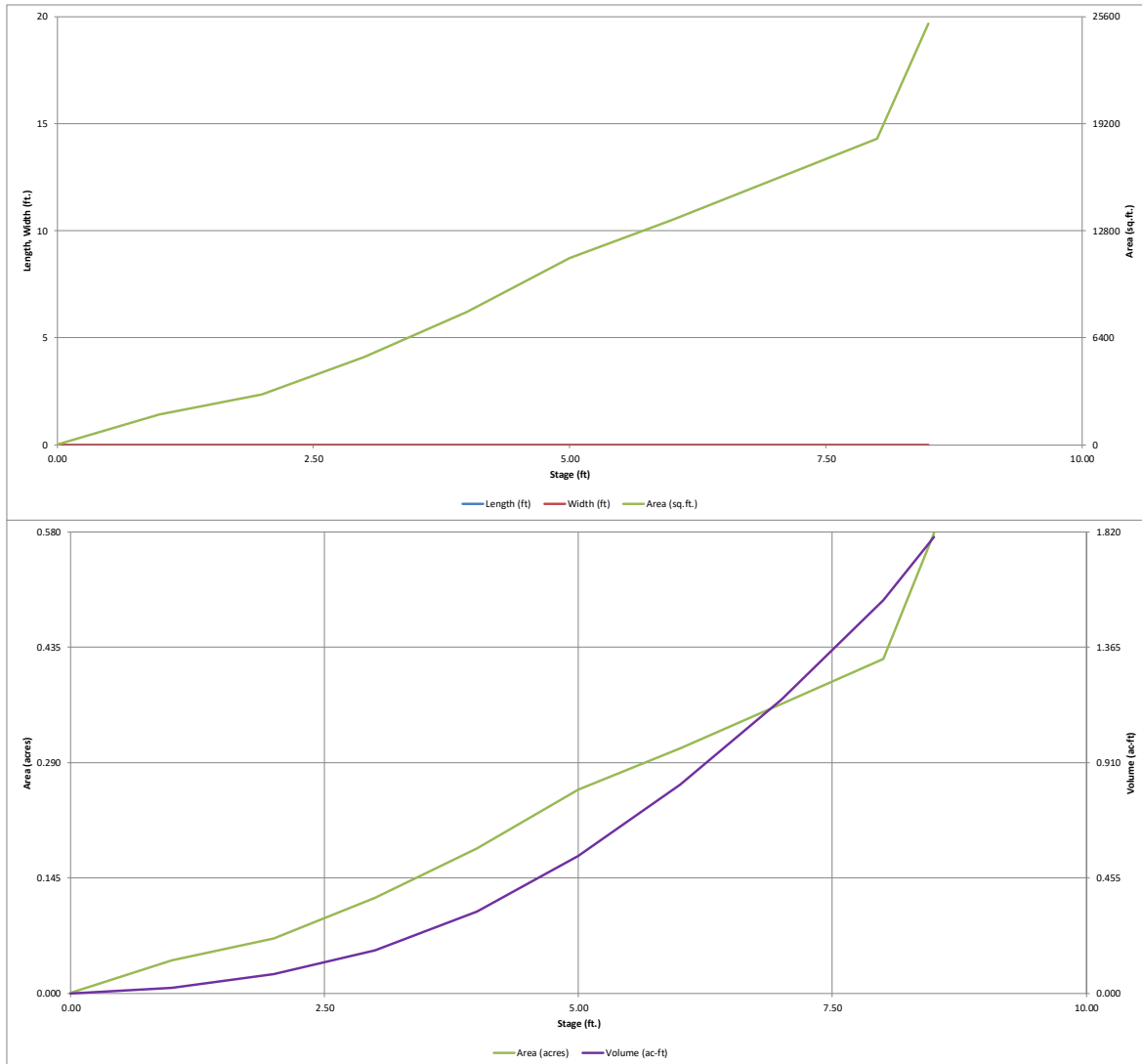
MHFD-Detention, Version 4.03 (May 2020)

Basin ID: Pond - Final

WINDERMERE FILING NO. 2 SOUTH POND
FINAL DESIGN DEVELOPED CONDITION

[illegible]

WINDERMERE FILING NO. 2 SOUTH POND
FINAL DESIGN DEVELOPED CONDITION



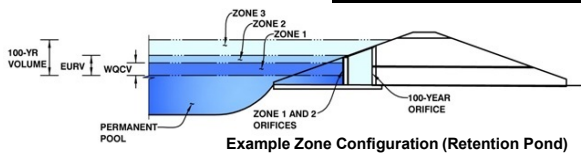
DETENTION BASIN OUTLET STRUCTURE

MHFD-Detention, Version 4.03 (M)

WINDERMERE FILING NO. 2 SOUTH POND
FINAL DESIGN DEVELOPED CONDITION

Project: Windermere Filing No. 2

Basin ID: Pond - Final



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.43	0.228	Orifice Plate
Zone 2 (EURV)	6.05	0.609	Orifice Plate
Zone 3 (100-year)	7.32	0.438	Weir&Pipe (Restrict)
Total (all zones)		1.275	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 6.05 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 24.20 inches
Orifice Plate: Orifice Area per Row = N/A inches

Calculated Parameters for Plate
WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.02	4.03					
Orifice Area (sq. inches)	1.17	1.18	1.18					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = N/A N/A ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = N/A N/A inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = Not Selected Not Selected ft²
Vertical Orifice Centroid = N/A N/A feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H_o = Zone 3 Weir Not Selected ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 3.92 N/A feet
Overflow Weir Grate Slope = 0.00 N/A H:V
Horiz. Length of Weir Sides = 3.93 N/A feet
Overflow Grate Open Area % = 70% N/A %, grate open area/total area
Debris Clogging % = 50% N/A %

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = Zone 3 Weir Not Selected feet
Overflow Weir Slope Length = 3.93 N/A feet
Grate Open Area / 100-yr Orifice Area = 16.94 N/A
Overflow Grate Open Area w/o Debris = 10.77 N/A ft²
Overflow Grate Open Area w/ Debris = 5.39 N/A ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe = Zone 3 Restrictor Not Selected ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 18.00 N/A inches
Restrictor Plate Height Above Pipe Invert = 7.00 N/A inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = Zone 3 Restrictor Not Selected ft²
Outlet Orifice Centroid = 0.34 N/A feet
Half-Central Angle of Restrictor Plate on Pipe = 1.35 N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 6.94 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 27.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.53 feet
Stage at Top of Freeboard = 8.47 feet
Basin Area at Top of Freeboard = 0.57 acres
Basin Volume at Top of Freeboard = 1.78 acre-ft

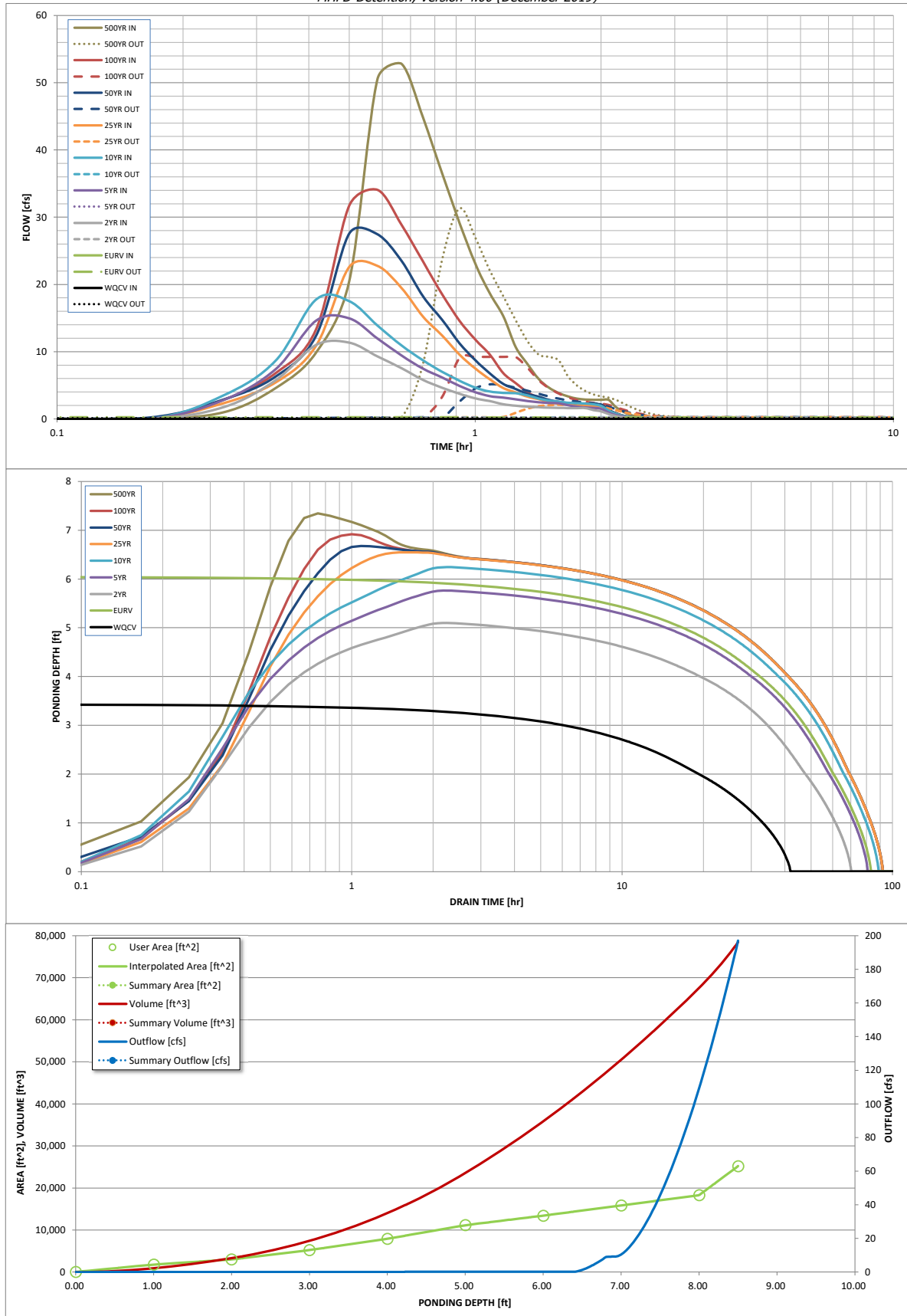
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.228	0.837	0.595	0.784	0.936	1.146	1.353	1.608	2.495
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.595	0.784	0.936	1.146	1.353	1.608	2.495
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.9	5.7	9.3	21.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.25	0.48	0.79	1.79
Peak Inflow Q (cfs) =	N/A	N/A	11.3	14.9	17.8	22.8	27.6	34.1	52.8
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.2	2.1	5.1	9.2	31.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.7	0.7	0.9	1.0	1.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.5	0.8	0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	73	63	72	78	80	78	76	70
Time to Drain 99% of Inflow Volume (hours) =	40	79	67	77	84	87	86	85	82
Maximum Ponding Depth (ft) =	3.43	6.05	5.10	5.76	6.24	6.54	6.68	6.91	7.34
Area at Maximum Ponding Depth (acres) =	0.15	0.31	0.26	0.30	0.32	0.34	0.35	0.36	0.38
Maximum Volume Stored (acre-ft) =	0.228	0.839	0.564	0.748	0.899	0.998	1.042	1.127	1.286

DETENTION BASIN OUTLET STRUCTURE

MHFD-Detention, Version 4.00 (December 2019)



DETENTION BASIN OUTLET STRUCTURE

Outflow Hydrograph Workbook Filename: _____

WINDERMERE FILING NO. 2 SOUTH POND
FINAL DESIGN DEVELOPED CONDITION

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.02	0.98
	0:15:00	0.00	0.00	1.73	2.81	3.48	2.34	2.88	2.85	4.59
	0:20:00	0.00	0.00	5.74	7.40	8.66	5.44	6.29	6.80	9.87
	0:25:00	0.00	0.00	10.99	14.61	17.77	10.89	12.38	13.35	20.48
	0:30:00	0.00	0.00	11.35	14.94	17.50	22.59	27.57	31.72	50.53
	0:35:00	0.00	0.00	9.29	11.96	13.90	22.77	27.44	34.08	52.82
	0:40:00	0.00	0.00	7.53	9.44	10.92	19.49	23.51	28.87	44.82
	0:45:00	0.00	0.00	5.79	7.46	8.72	15.22	18.22	23.40	36.52
	0:50:00	0.00	0.00	4.63	6.16	7.01	12.40	14.73	18.52	29.23
	0:55:00	0.00	0.00	3.73	4.91	5.68	9.57	11.28	14.63	23.11
	1:00:00	0.00	0.00	3.04	3.95	4.64	7.49	8.73	11.81	18.69
	1:05:00	0.00	0.00	2.64	3.39	4.06	5.91	6.79	9.60	15.30
	1:10:00	0.00	0.00	2.19	3.17	3.87	4.58	5.22	6.81	10.67
	1:15:00	0.00	0.00	1.95	2.91	3.81	3.93	4.45	5.32	8.17
	1:20:00	0.00	0.00	1.81	2.65	3.49	3.31	3.73	3.98	5.97
	1:25:00	0.00	0.00	1.73	2.48	3.03	2.93	3.30	3.17	4.65
	1:30:00	0.00	0.00	1.67	2.38	2.74	2.52	2.83	2.69	3.86
	1:35:00	0.00	0.00	1.64	2.31	2.54	2.26	2.54	2.37	3.34
	1:40:00	0.00	0.00	1.61	2.02	2.41	2.10	2.36	2.18	3.02
	1:45:00	0.00	0.00	1.61	1.82	2.33	2.00	2.24	2.09	2.89
	1:50:00	0.00	0.00	1.61	1.70	2.28	1.94	2.18	2.05	2.84
	1:55:00	0.00	0.00	1.32	1.62	2.17	1.91	2.15	2.04	2.83
	2:00:00	0.00	0.00	1.13	1.51	1.93	1.89	2.13	2.04	2.83
	2:05:00	0.00	0.00	0.72	0.95	1.23	1.21	1.36	1.30	1.79
	2:10:00	0.00	0.00	0.44	0.59	0.77	0.76	0.85	0.82	1.12
	2:15:00	0.00	0.00	0.27	0.36	0.47	0.46	0.52	0.49	0.68
	2:20:00	0.00	0.00	0.15	0.21	0.27	0.27	0.30	0.29	0.40
	2:25:00	0.00	0.00	0.07	0.12	0.14	0.15	0.17	0.16	0.22
	2:30:00	0.00	0.00	0.03	0.05	0.06	0.06	0.07	0.07	0.09
	2:35:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DRAINAGE MAPS

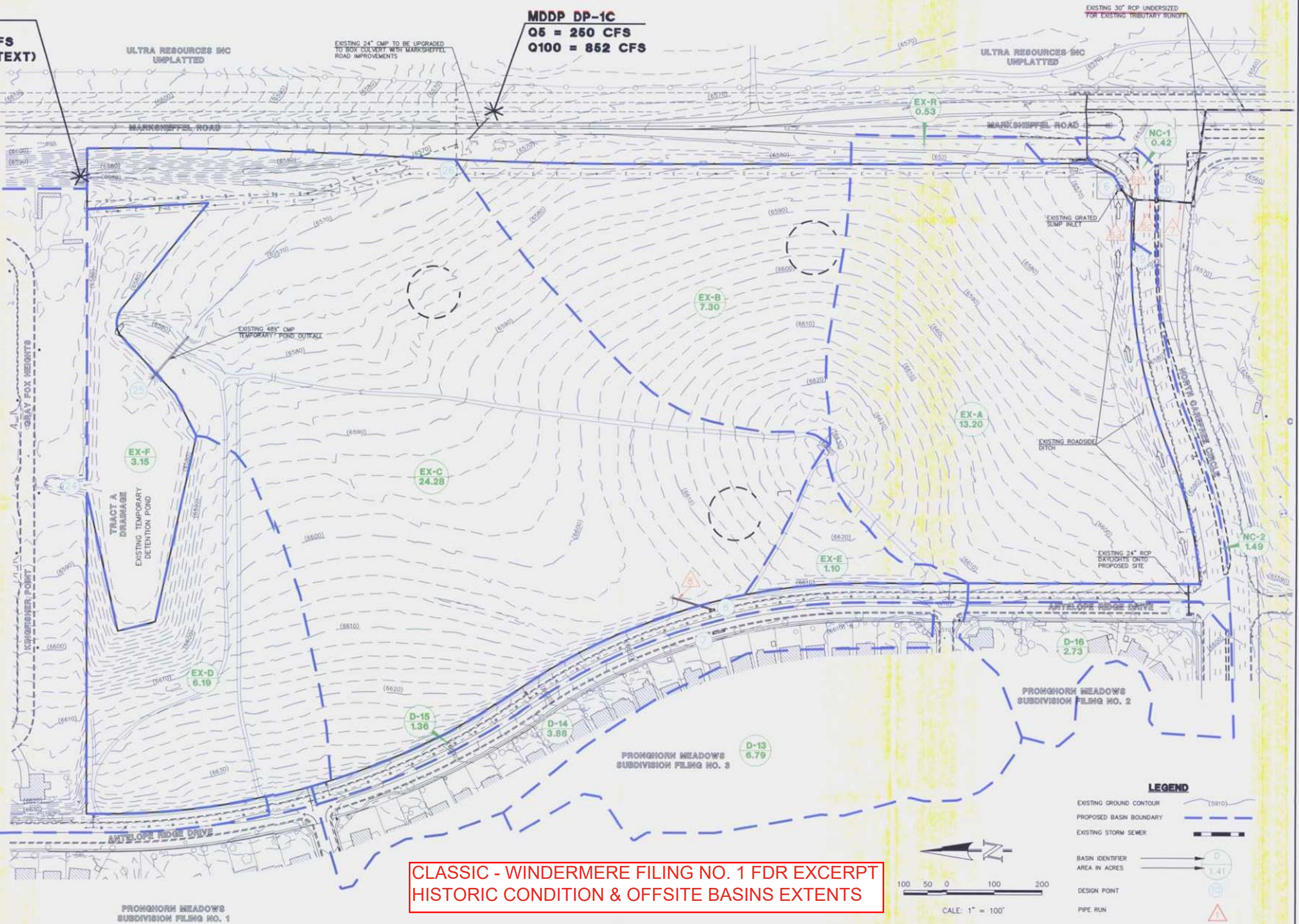
BASIN RUNOFF SUMMARY		
BASIN	Q5 (CFS)	Q100 (CFS)
EX-A	11.3	28.2
EX-B	5.7	14.2
EX-C	17.7	44.1
EX-D	5.8	14.5
EX-E	1.0	2.6
EX-F	4.0	10.0
EX-R	1.7	3.4
D-13	13.8	28.5
D-14	7.2	15.1
D-15	4.6	8.6
D-16	7.2	14.6
NC-1	1.9	3.6
NC-2	6.7	12.5
WS	47.3	86.4
CT	90.8	184.7

MDDP DP-1X
Q5 = 185 CFS
Q100 = 600 CFS
(SEE REPORT TEXT)

MDDP DP-1C
Q5 = 250 CFS
Q100 = 852 CFS

PIPE RUN SUMMARY			
PIPE	Q5 (CFS)	Q100 (CFS)	PIPE SIZE
6A	4.8	8.1	EX. 18"
6B	18.4	42.6	EX. 24"
6C	21.6	47.9	EX. 24"
7	24.2	53.3	EX. 30"
8	24.7	50.9	EX. 36"

DESIGN POINT SUMMARY			
DESIGN POINT	Q5 (CFS)	Q100 (CFS)	FACILITY
4	7.2	14.6	EX. 8" SUMP INLET
6	18.4	42.6	EX. TYPE D GRATED INLET
7	20.0	41.6	EX. 25' SUMP INLET
8	5.6	11.2	EX. 10' SUMP INLET
19	6.7	12.5	EX. 15' AT-GRADE INLET
20	3.7	8.0	EX. 10' SUMP INLET
24	111.3	199.7	OFF-SITE RUNOFF TO POND
25	117.5	215.1	TOTAL EXISTING TO POND
26	138.3	266.9	EX. TO MARKSHEFFEL RD.



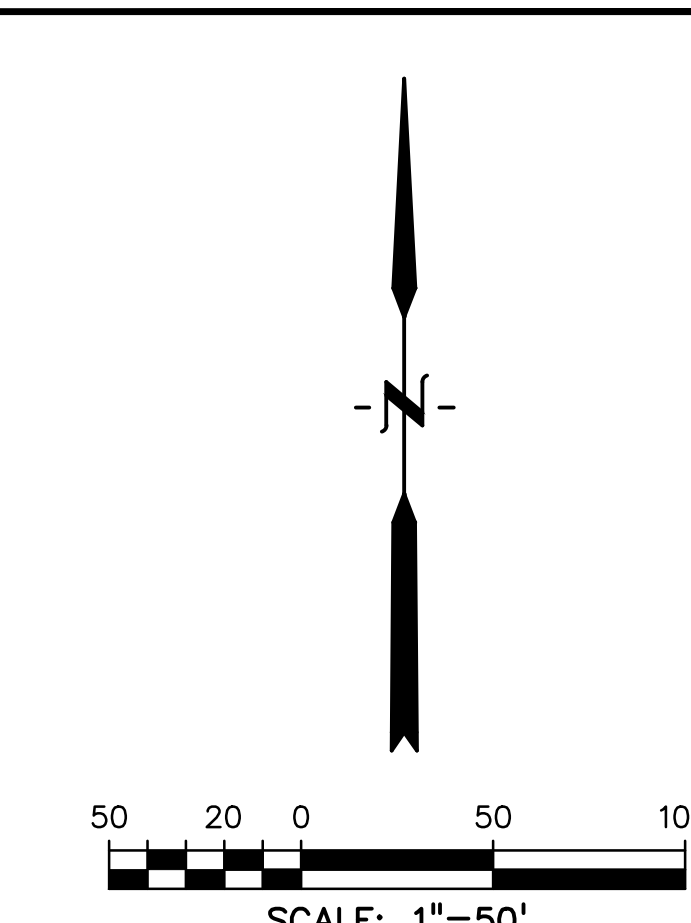
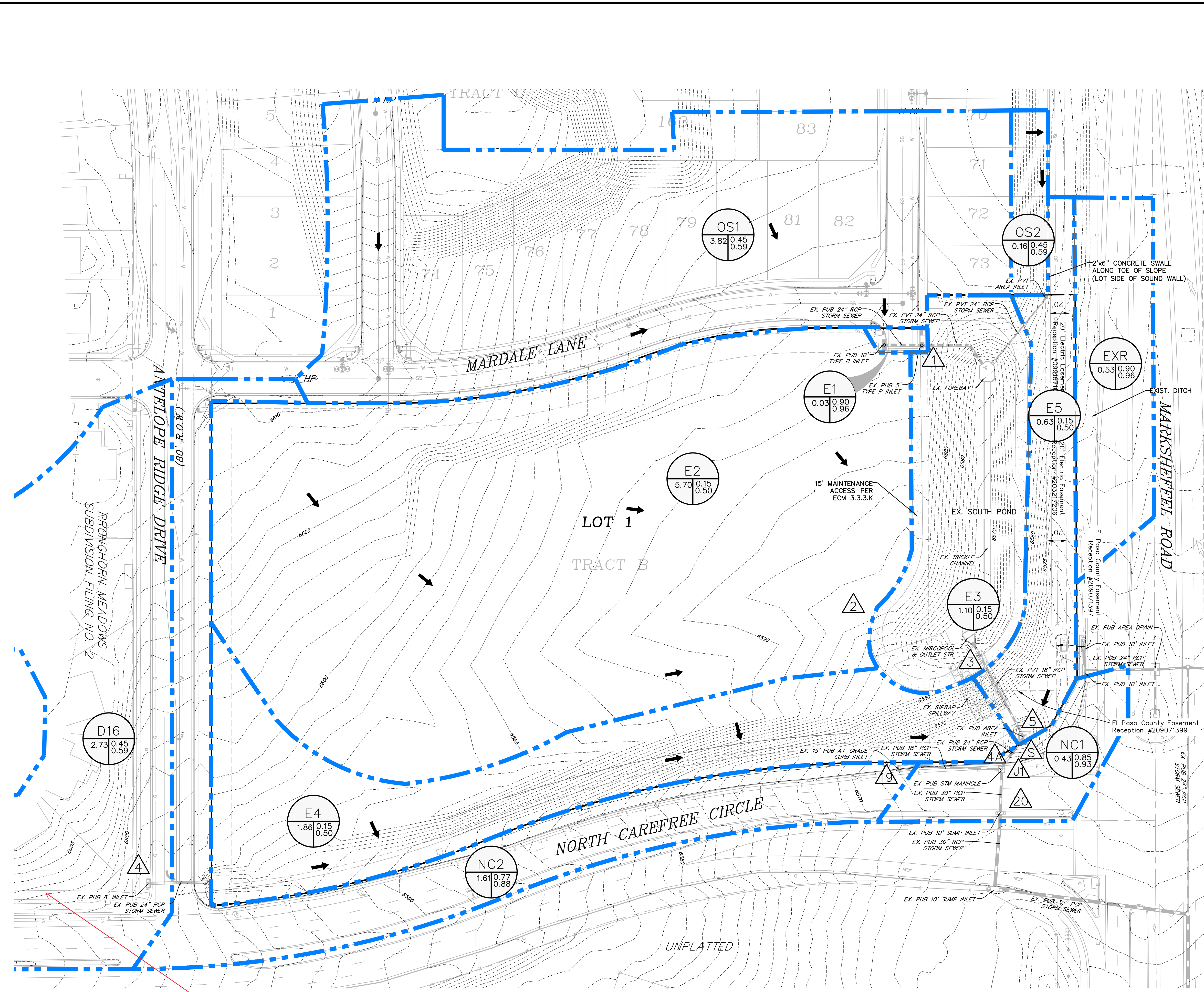
LEGEND

- EXISTING GROUND CONTOUR (5810)
- PROPOSED BASIN BOUNDARY
- EXISTING STORM SEWER
- BASIN IDENTIFIER
- AREA IN ACRES (1.41)
- DESIGN POINT
- PIPE RUN

SCALE: 1" = 100'

PAGE 123

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS 811 UTILITY NOTIFICATION OF COLORADO IT'S THE LAW THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.		NO. REVISION DATE REVIEW:	PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC KYLE R. CAMPBELL, COLORADO P.E. #29794 DATE	CLASSIC CONSULTING ENGINEERS & SURVEYORS 6385 Corporate Drive, Suite 101 Colorado Springs, Colorado 80915 (719)785-0790 (719)785-0799(Fax)	WINDERMERE EXISTING CONDITIONS DRAINAGE MAP PRELIMINARY DRAINAGE REPORT WINDERMERE FINAL DRAINAGE REPORT WINDERMERE FIL NO. 1 DESIGNED BY: MAL SCALE: (H) 1" = 100' DATE: 09/01/14 DRAWN BY: MAL SHEET: 1 OF 1 CHECKED BY: (V) 1" = N/A JOB NO.: 2241.000
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LEGEND

- EX. INTERMEDIATE CONTOUR
- EX. INDEX CONTOUR
- EX. MANHOLE
- EX. STORM SEWER
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT
- BASIN
- AREA (ACRE)
- C5
- C100

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1		3.82	7.0	15.5
OS2		0.16	0.3	0.6
E1		0.03	0.2	0.3
E2	1	3.85	7.1	15.7
E3	2	5.70	2.9	16.1
E4	3	1.10	0.8	4.5
E5	4	10.81	9.5	32.3
EXR	5	2.73	4.7	10.3
D16	6	1.86	0.9	5.3
NC1	7	4.59	4.8	13.6
NC2	8	0.63	0.4	2.4
J1	9	5.75	6.7	18.1
S1	10	1.61	6.4	12.2
S2	11	7.36	10.5	25.5
S3	12	0.43	1.9	3.4
S4	13	7.79	11.7	27.6

REFERENCE HISTORIC MAP FOR BASIN D16 EXTENTS

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers-Surveyors
101 SAWATCH ST. STE 100
COLORADO SPGS, COLORADO 80903
CONTACT: TIM D. McCONNELL, P.E.
(719) 260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

COLO WINDERMERE #2, LLC
4164 AUSTIN BLUFFS FWY, #361
COLORADO SPRINGS, CO 80918
(719) 200-9594
CONTACT: JAMES TODD STEPHENS

DRAINAGE PLANS FOR
WINDERMERE FILING 2
N. MARKSHEFFEL ROAD
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	4/1/22
REVISED	8/26/24

DESIGNED BY: KGV
DRAWN BY: CGH
CHECKED BY: TDM
FILE NAME:
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

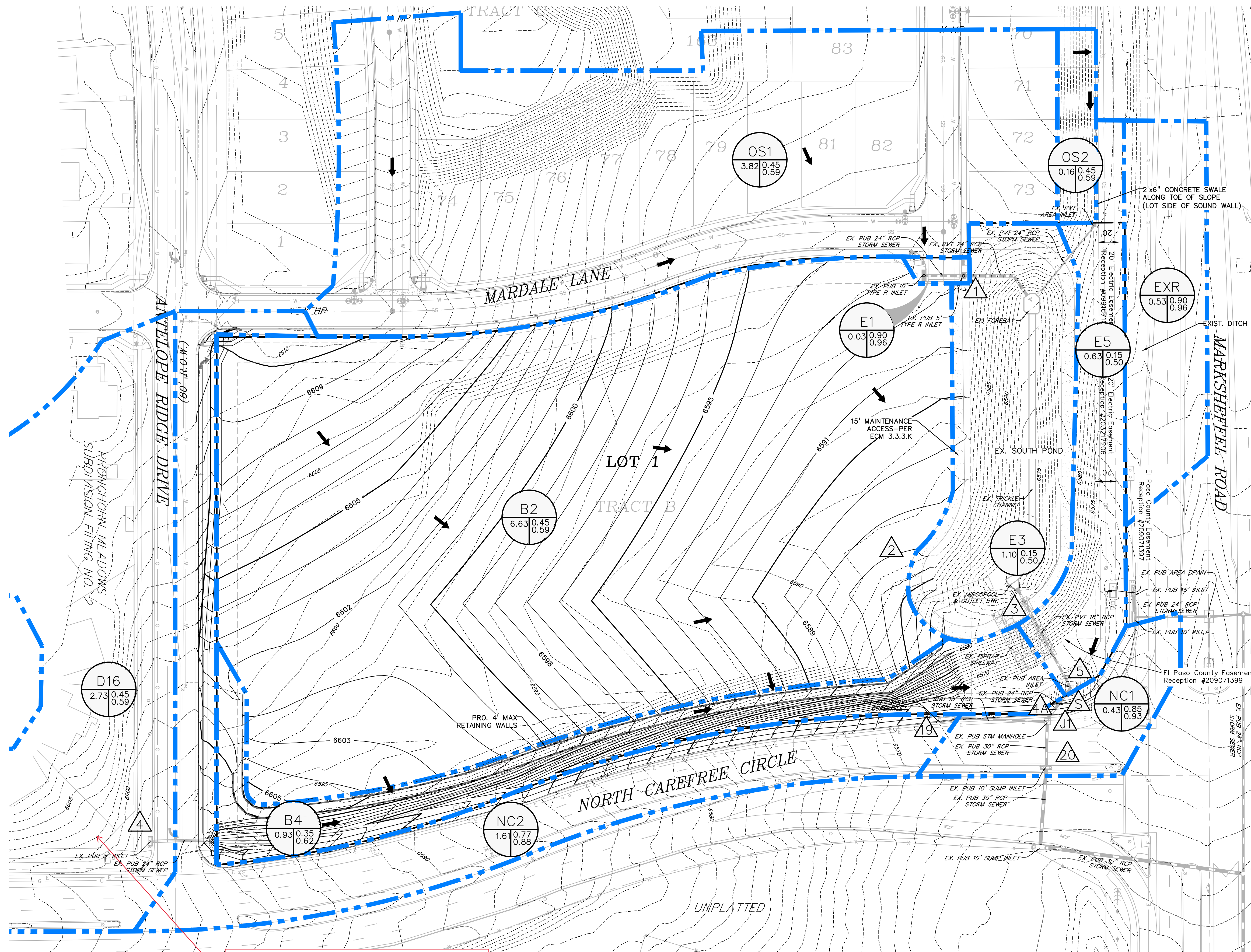
DRAWING SCALE:
HORIZONTAL: 1" = 50'
VERTICAL: N/A

EXISTING DRAINAGE MAP

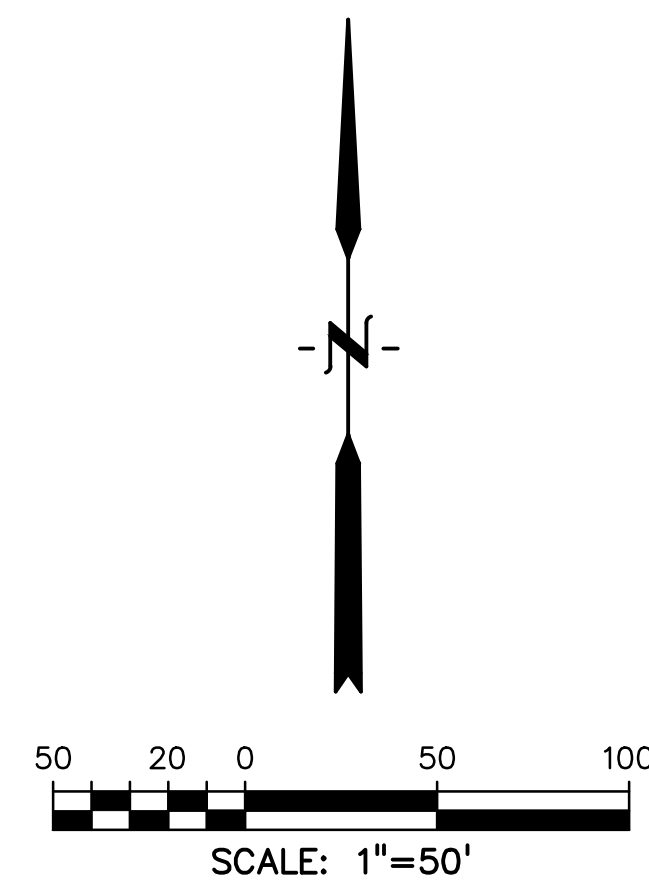
PROJECT NO. 21187-03CSCV
DRAWING NO.

EDR

SHEET: 1 OF 2

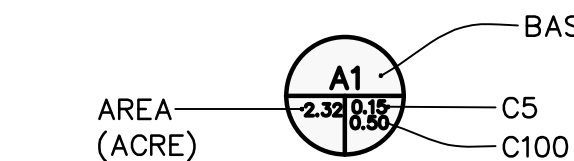


REFERENCE HISTORIC MAP
FOR BASIN D16 EXTENTS



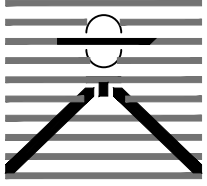
LEGEND

- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- EX. INTERMEDIATE CONTOUR
- EX. INDEX CONTOUR
- PROPOSED STORM SEWER
- PROPOSED INLET
- PROPOSED FLARED END SECTION
- EX. MANHOLE
- EX. STORM SEWER
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT



BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1		3.82	7.0	15.5
OS2		0.16	0.3	0.6
E1		0.03	0.2	0.3
	1	3.85	7.1	15.7
B2	2	6.63	11.8	26.0
E3		1.10	0.8	4.5
	3	11.74	19.4	44.8
D16	4	2.73	4.7	10.3
B4		0.93	1.2	3.4
	4A	3.66	5.0	11.7
E5	5	0.63	0.4	2.4
EXR		0.53	2.4	4.4
	S	4.82	7.7	25.3
NC2	19	1.61	6.4	12.2
	J1	6.43	10.7	23.6
NC1		0.43	1.9	3.4
	20	6.86	11.8	25.7

PREPARED BY:



DREXEL, BARRELL & CO.
Engineers-Surveyors
101 SAWATCH ST. STE 100
COLORADO SPRINGS, COLORADO 80903
CONTACT: TIM D. McCONNELL, P.E.
(719) 260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

COLO WINDERMERE #2, LLC
4164 AUSTIN BLUFFS FWY, #361
COLORADO SPRINGS, CO 80918
(719) 200-9594
CONTACT: JAMES TODD STEPHENS

DRAINAGE PLANS FOR

WINDERMERE FILING 2

N. MARKSHEFFEL ROAD
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	4/1/22
REVISED	8/26/24
DESIGNED BY:	KGW
DRAWN BY:	CGH
CHECKED BY:	TDM
FILE NAME:	
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.	

DRAWING SCALE:
HORIZONTAL: 1" = 50'
VERTICAL: N/A

PROPOSED
DRAINAGE MAP

PROJECT NO. 21187-03CSCV
DRAWING NO.

PDR

SHEET: 2 OF 2

***APPENDIX E – EXISTING CURB INLET CALCUALTIONS FROM FINAL DRAINAGE
REPORT FOR WINDERMERE FILING No. 1 – DREXEL, BARRELL & CO.***

FINAL DRAINAGE REPORT
for
WINDERMERE FILING NO. 1

Colorado Springs, CO

March 8, 2022

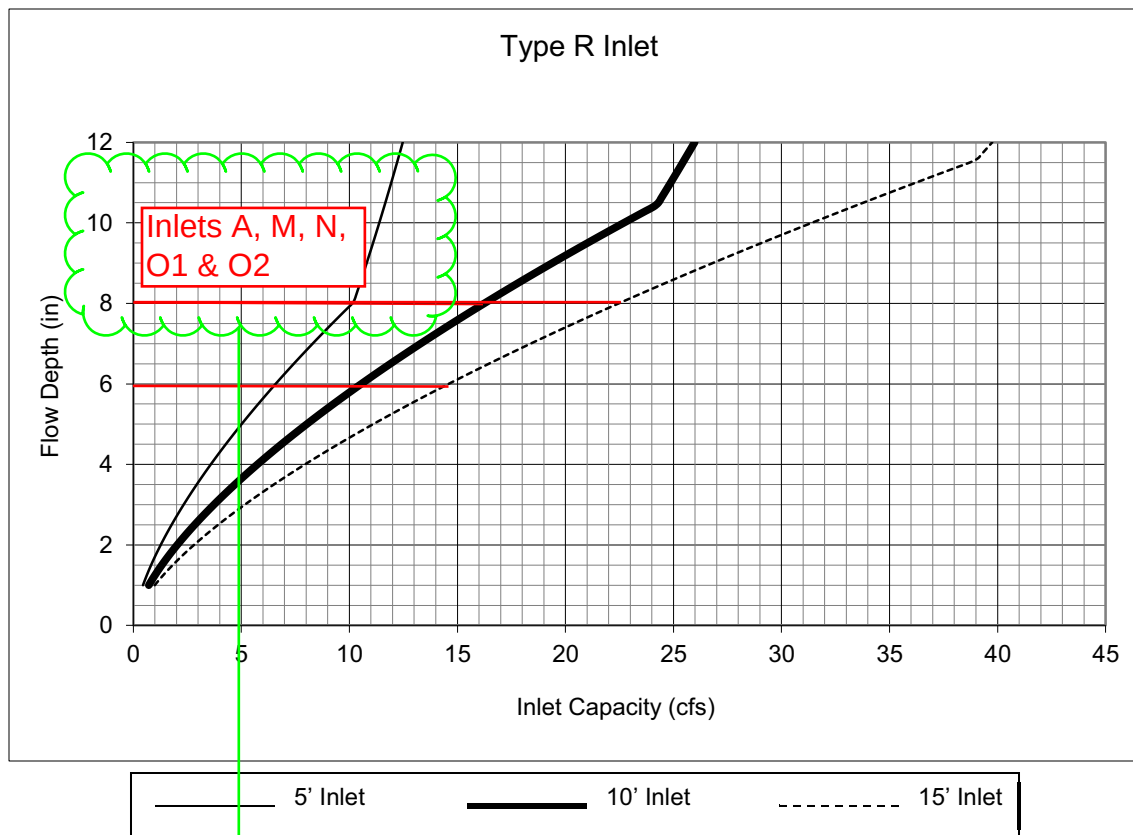
SF-21-026

Prepared for:

Eagle Development Company
212 N. Wahsatch Ave., Suite 301
Colorado Springs, CO 80903
Contact: Jeff Mark
(719) 635-3200

Prepared by:

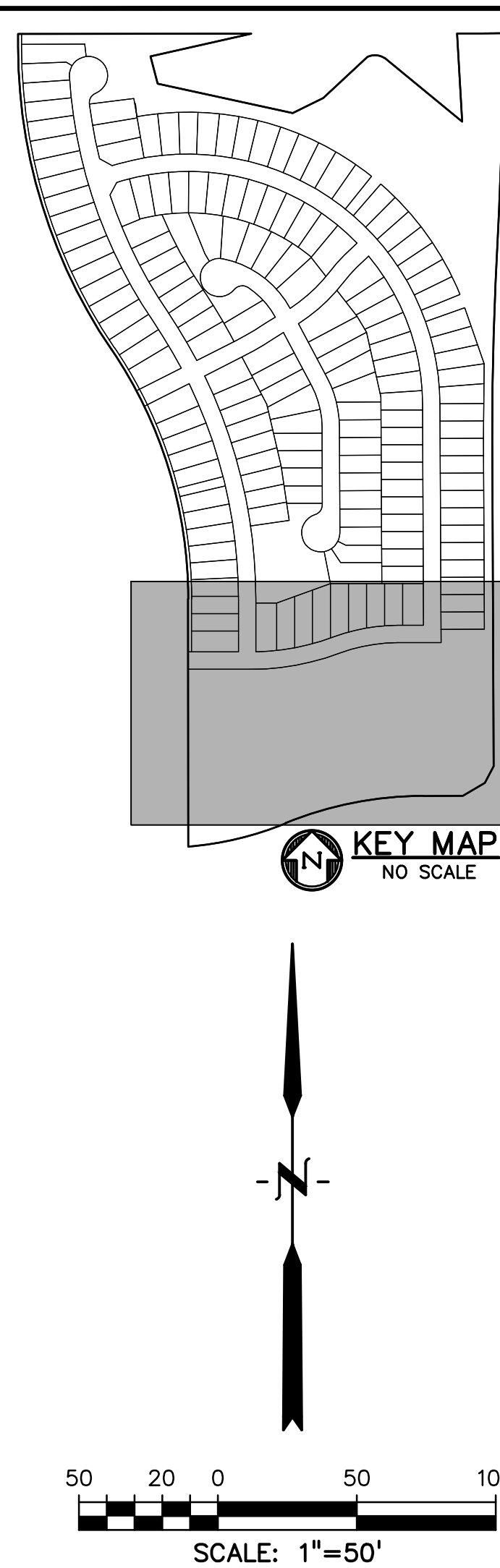
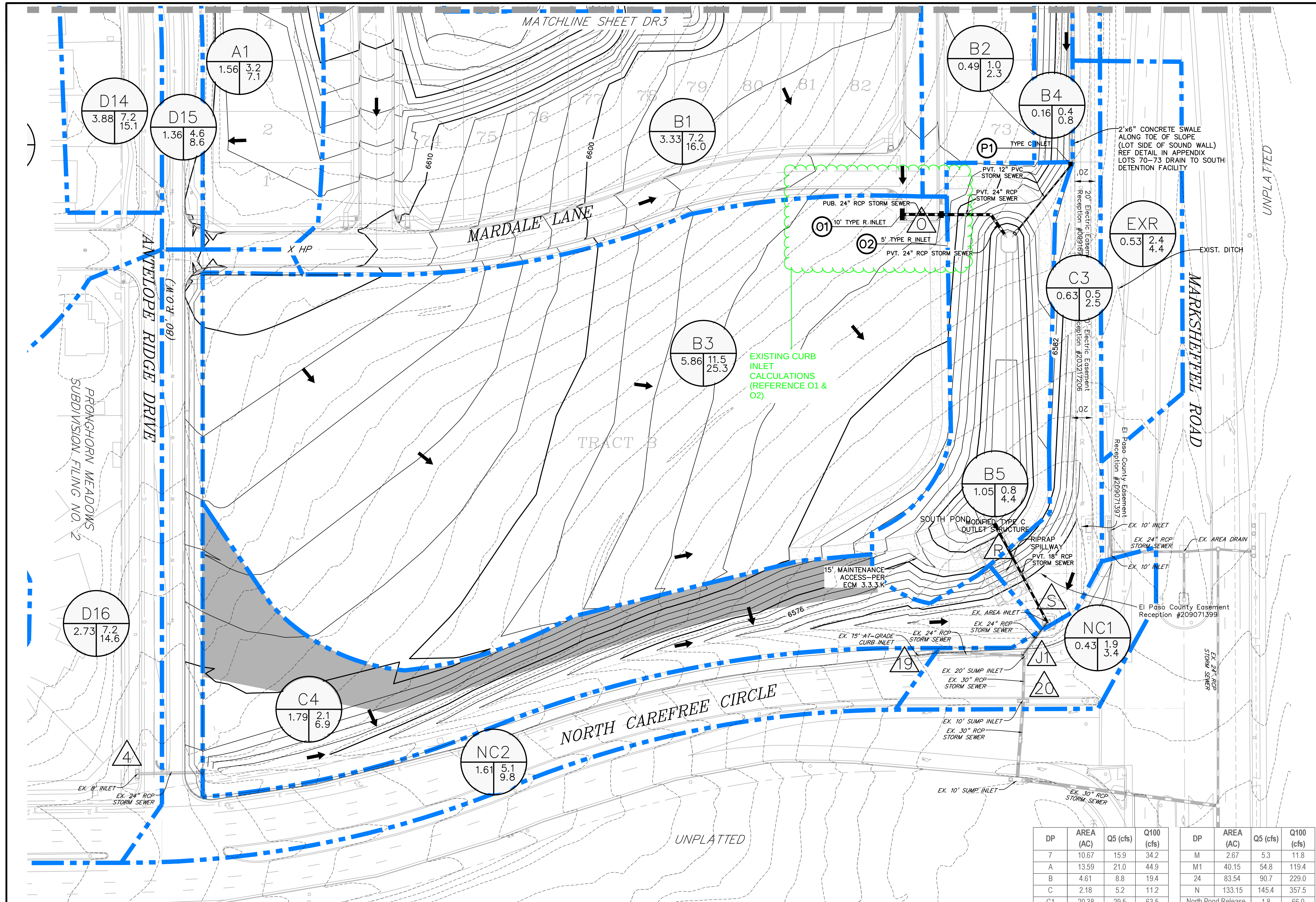
Drexel, Barrell & Co.
3 South Seventh Street
Colorado Springs, CO 80905
Contact: Tim McConnell, P.E.
(719) 260-0887

Figure 8-11. Inlet Capacity Chart Sump Conditions , Curb Opening (Type R) Inlet

CURB INLET
CALCULATIONS
FOR O1 & O2

Notes:

1. The standard inlet parameters must apply to use this chart.



LEGEND

- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- EX. INTERMEDIATE CONTOUR
- EX. INDEX CONTOUR
- PROPOSED STORM SEWER
- PROPOSED INLET
- PROPOSED FLARED END SECTION
- PROPOSED SITE LIGHTING
- EX. MANHOLE
- EX. STORM SEWER
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT
- AREA (ACRE)
- BASIN
- Q5 (cfs)
- Q100 (cfs)
- DEVELOPED AREA DRAINING OFFSITE SEE SHEET DR4

DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
7	10.67	15.9	34.2
A	13.59	21.0	44.9
B	4.61	8.8	19.4
C	2.18	5.2	11.2
C1	20.38	29.5	63.5
D	1.01	1.7	3.8
D1	21.39	30.6	66.1
E	1.98	4.3	9.5
F	3.73	7.0	15.4
F1	27.10	38.2	82.8
G	1.56	3.0	6.6
H	2.96	6.1	13.4
H1	4.52	8.6	19.0
I	1.86	4.0	8.7
J	6.38	11.8	25.9
K	33.48	46.3	100.7
L	4.00	7.5	16.5
L1	37.48	51.4	111.8

DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
M	2.67	5.3	11.8
M1	40.15	54.8	119.4
24	83.54	90.7	229.0
N	133.15	145.4	357.5
North Pond Release	1.8	66.0	
T	437.97	190.5	682.4
O	3.82	8.1	17.9
R	10.89	19.9	46.2
South Pond Release	0.2	9.2	
4	2.73	4.9	10.7
S	16.57	10.0	33.7
19	1.61	5.1	9.8
J1	18.18	15.1	43.5
20	18.61	17.0	46.9
V	0.11	0.1	0.5

NOTE: SEE "PRELIMINARY DRAINAGE REPORT FOR WINDERMERE," BY CLASSIC CONSULTING ENGINEERS & SURVEYORS, OCTOBER 2014 FOR EXISTING DRAINAGE MAP AND CALCULATIONS INCLUDING BASINS D16, NC1, NC2 AND THEIR DESIGN POINTS

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719) 260-0887
BOULDER • COLORADO SPRINGS • GREELEY

CLIENT:

THE LANDHUIS COMPANY
212 N. WAHSATCH AVE., #301
COLORADO SPRINGS, CO 80903
(719) 635-3200
CONTACT: JEFF MARK

DRAINAGE MAP FOR
WINDERMERE
FILING NO. 1
N. MARKSHEFFEL ROAD
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	7-9-21
RESUBMITTAL	1-5-22
DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 50'
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21187-01CSGV
DRAWING NO.

DR4

SHEET: 4 OF 5

Know what's below.
Call before you dig.

CALL 3-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

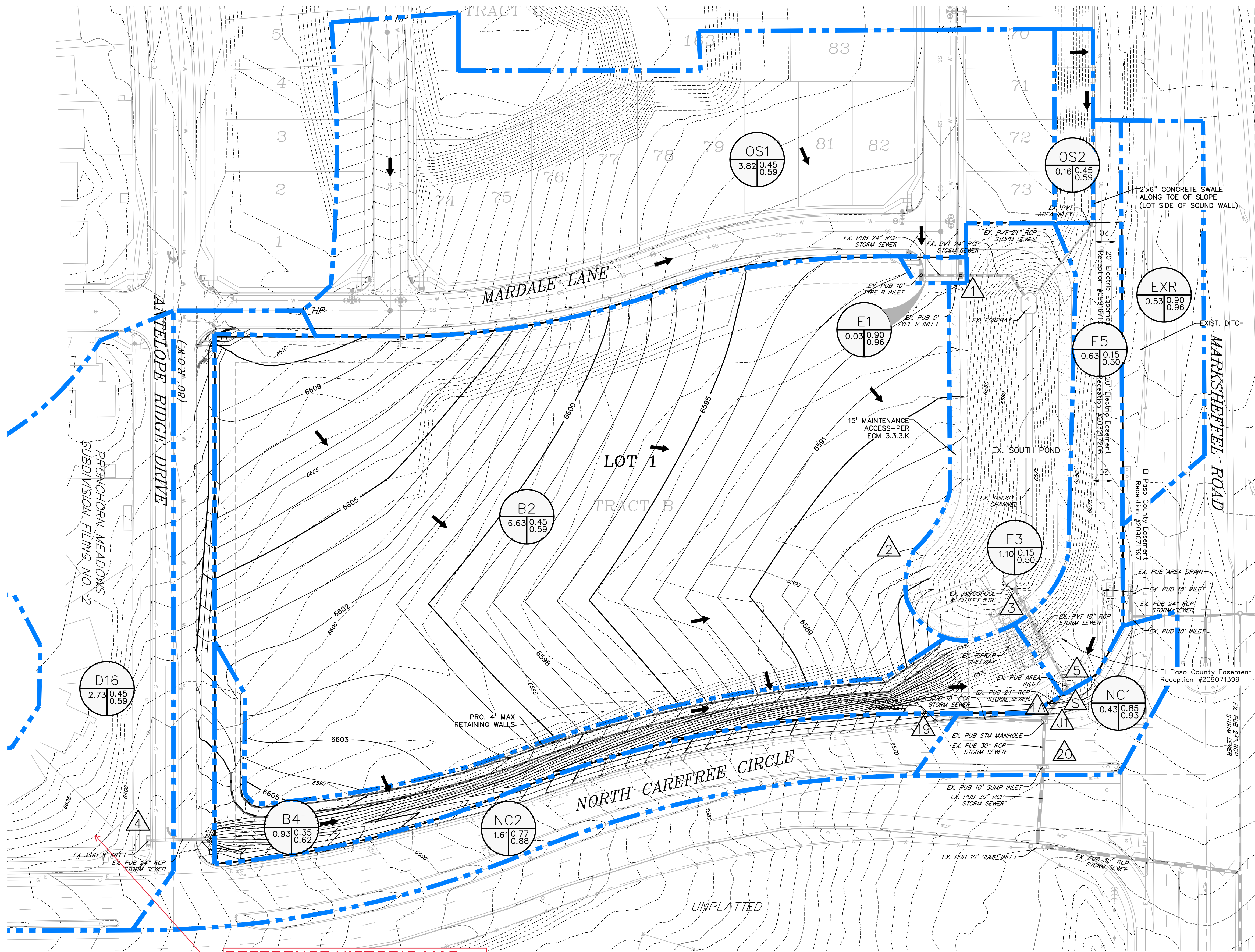
Windermere Inlet Summary

Location	Inlet #	Basin/DP	Q5 (cfs)	Q100 (cfs)	Street grade %	Pro. Inlet Type	Q5 capture (cfs)	Q5 bypass (cfs)	Q5 % capture	Q100 capture (cfs)	Q100 bypass (cfs)	Q100 % capture	Downstream
DP8		Basin D15	4.5	8.6									
		Basin A1	3.2	7.1									
	A	Total	7.7	15.7	sump	10' Type R (S)	10.5	0.0	100%	16.0	0.0	100%	Sump ok
DPB	B	Basin A2	8.8	19.4	3.8%	10' Type R (AG)	9.5	0.0	100%	13.0	6.4	67%	Bypass to E
DPC	C	Basin A3	5.2	11.2	3.8%	10' Type R (AG)	9.5	0.0	100%	13.0	0.0	116%	Bypass to D
DPD		Basin A4	1.7	3.8									
		Inlet C Bypass	0.0	0.0									
	D	Total	1.7	3.8	3.9%	5' Type R (AG)	3.3	0.0	100%	6.2	0.0	100%	No Bypass
DPE		Basin A5	4.3	9.5									
		Inlet B Bypass	0.0	6.4									
	E	Total	4.3	15.9	3.9%	15' Type R (AG)	13.3	0.0	100%	18.0	0.0	100%	No Bypass
DPF		Basin A6	7.0	15.4									
		Inlet C Bypass	0.0	0.0									
	F	Total	7.0	15.4	3.9%	15' Type R (AG)	13.3	0.0	100%	18.0	0.0	100%	No Bypass
DPH	J	Basin A8	6.1	13.4	0.8%	10' Type R (AG)	7.0	0.0	100%	12.5	0.9	100%	Bypass to I
DPG	L	Basin A7	3.0	6.6	0.8%	5' Type R (AG)	3.8	0.0	100%	6.0	0.6	91%	Bypass to N
DPI		Basin A9	4.0	8.7									
		Inlet J Bypass	0.0	0.9									
	I	Total	4.0	9.7			7.0	0.0	100%	12.5	0.0	100%	No Bypass
DPL		Basin A10	7.5	16.5									
	M	Total	7.5	16.5			14.5	0.0	100%	22.5	0.0	100%	Sump ok
Basin A11		Basin A11	5.3	11.8									
		Inlet L Bypass	0.0	0.6									
	N	Total	5.3	12.3	Sump	10' Type R (S)	10.5	0.0	100%	16.0	0.0	100%	Sump ok
		Basin B1	7.2	16.0									
	O1	Total	7.2	16.0	3.9%	10' Type R (S)	16.0	0.0	100%	16.0	0.0	100%	No Bypass
		Basin B2	1.0	2.3									
	O2	Total	1.0	2.3	3.9%	5' Type R (S)	6.3	0.0	100%	6.3	0.0	100%	No Bypass

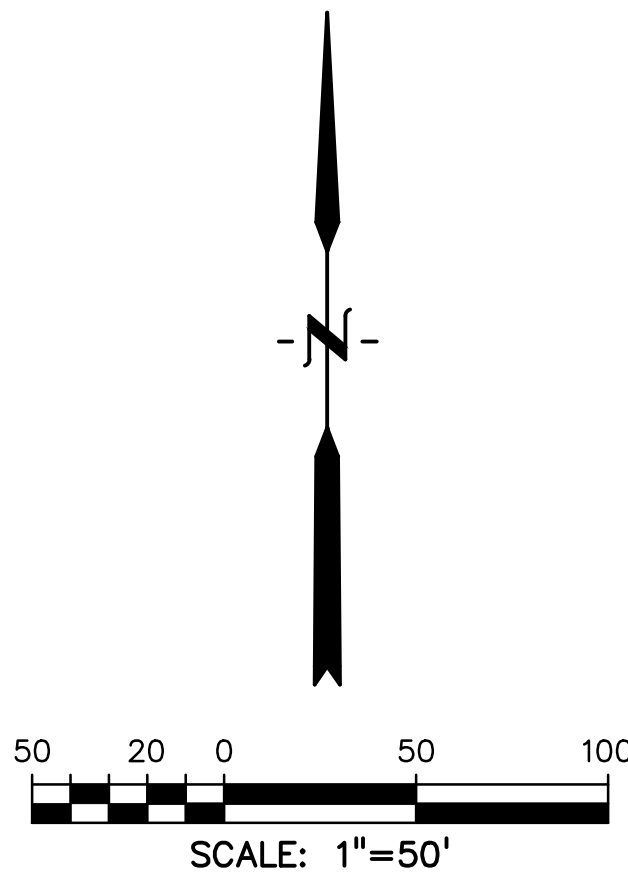
EXISTING CURB
INLET
CALCULATIONS
FOR O1 & O2

APPENDIX F - EXISTING AND PROPOSED DRAINAGE MAPS

EXISTING CONDITIONS DRAINAGE MAP

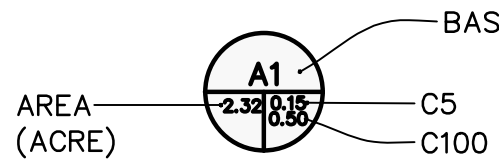


REFERENCE HISTORIC MAP
FOR BASIN D16 EXTENTS



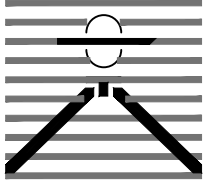
LEGEND

- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- EX. INTERMEDIATE CONTOUR
- EX. INDEX CONTOUR
- PROPOSED STORM SEWER
- PROPOSED INLET
- PROPOSED FLARED END SECTION
- EX. MANHOLE
- EX. STORM SEWER
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT



BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1		3.82	7.0	15.5
OS2		0.16	0.3	0.6
E1		0.03	0.2	0.3
B2	1	3.85	7.1	15.7
E3	2	6.63	11.8	26.0
E5	3	1.10	0.8	4.5
D16	4	2.73	4.7	10.3
B4		0.93	1.2	3.4
NC1	4A	3.66	5.0	11.7
EXR	5	0.53	0.4	2.4
S		4.82	7.7	25.3
NC2	19	1.61	6.4	12.2
J1		6.43	10.7	23.6
NC1		0.43	1.9	3.4
20		6.86	11.8	25.7

PREPARED BY:



DREXEL, BARRELL & CO.
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COLORADO SPGS, COLORADO 80903
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CLIENT:

COLO WINDERMERE #2, LLC
4164 AUSTIN BLUFFS FWY, #361
COLORADO SPRINGS, CO 80918
(719) 200-9594
CONTACT: JAMES TODD STEPHENS

DRAINAGE PLANS FOR

WINDERMERE FILING 2

N. MARKSHEFFEL ROAD
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	4/1/22
REVISED	8/26/24
DESIGNED BY:	KGW
DRAWN BY:	CGH
CHECKED BY:	TDM
FILE NAME:	
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.	

DRAWING SCALE:
HORIZONTAL: 1" = 50'
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21187-03CSCV
DRAWING NO.

PDR

SHEET: 2 OF 2

DESIGN POINT NOTES:

- 1A** DESIGN POINT 1A REPRESENTS TRIBUTARY TOTAL FLOWS TO THE EX. DETENTION BASIN (TRIBUTARY TOTAL FROM PR. CIA CALCS - THIS SHEET)
5-YR: 18.63 CFS
100-YR: 41.93 CFS
- 1B** DESIGN POINT 1B REPRESENTS TRIBUTARY TOTAL FLOWS TO THE EX. DETENTION BASIN (TRIBUTARY TOTAL FROM PR. CIA CALCS - THIS SHEET) + DESIGN POINT 1X FROM EX. FLOWS (REFERENCE CALL-OUT ON MAP)
5-YR: 26.13 CFS
100-YR: 58.33 CFS
- A** DESIGN POINT A REPRESENTS TRIBUTARY TOTAL PROPOSED FLOWS TO THE EX. AREA INLET (DP CD8 + DP CD13 + D16 + EXR)
5-YR: 7.21 CFS
100-YR: 17.90 CFS

KEY NOTES

- PROPOSED PRIVATE 5' CDOT TYPE-R CURB INLET
- PROPOSED PRIVATE CDOT TYPE-C AREA INLET
- PROPOSED PRIVATE 18" STORM PIPE
- EXISTING 15' WIDE POND MAINTENANCE ACCESS ROAD
- EXISTING 24" STORM PIPE
- EXISTING 6' WIDE CONCRETE TRICKLE CHANNEL
- EXISTING RIPRAP EMERGENCY SPILLWAY
- PROPOSED RESIDENTIAL TOWNHOUSE BUILDING
- PROPOSED STORM MANHOLE
- EXISTING CONCRETE FOREBAY WITH T-Baffles
- EXISTING PRIVATE MODIFIED CDOT TYPE-C OUTLET CONTROL STRUCTURE & MICROPOOL
- EXISTING PUBLIC CDOT TYPE-C AREA INLET
- EXISTING 18" STORM OUTFALL PIPE
- PROPOSED 24" STORM PIPE
- PROPOSED 18" STORM PIPE
- PROPOSED RETAINING WALL (BY OTHERS)
- PROPOSED DRAINAGE SWALE
- EXISTING 12" STORM PIPE
- EXISTING PUBLIC CURB INLET

- PR. EXCLUSION AREA PER EPC
ECM 1.7.1.B.2.1 - ±0.09 AC
(NOT TRIBUTARY TO EX. EDB)
- PR. EXCLUSION AREA PER EPC
ECM 1.7.1.C.1.a - ±0.96 AC
(NOT TRIBUTARY TO EX. EDB)

LEGEND

- PROPERTY LINE
- EX. MAJOR CONTOUR
- EX. MINOR CONTOUR
- PR. MAJOR CONTOUR
- PR. MINOR CONTOUR
- PR. DRAINAGE BASIN BOUNDARY
- PR. FLOW PATH
- PROPOSED
A = BASIN DESIGNATION
B = AREA IN ACRES
C = 5-YR RUNOFF
D = 100-YR RUNOFF
- EXISTING SUB-BASIN DESIGNATION
(REF. DRAINAGE MAP
IN PDR BY D&B)
- # = DESIGN POINT DESIGNATION
- EXISTING SLOPE ARROW
- PROPOSED SLOPE ARROW

Kimley»Horn

PROJECT NAME: Windermere Filing No. 2
PROJECT NUMBER: 196160000
CALCULATED BY: DPM
CHECKED BY: NMB

DATE: 1/8/2026

PROPOSED RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	PEAK FLOWS (CFS)	
			Q5	Q100
On-Site Basins				
D1	P1	0.51	1.27	2.72
D2	P2	0.40	1.01	2.22
D3	P3	0.74	2.64	5.07
D4	P4	1.39	4.32	8.66
D5	P5	0.49	0.24	1.48
D6	P6	1.68	5.81	11.19
D7	P7	0.29	0.30	1.15
D8	P8 ^{1,2}	0.80	0.07	1.83
D8A	P8A ^{1,2}	0.05	0.11	0.25
D8B	P8B ^{1,2}	0.02	0.06	0.11
D9	P9	1.16	0.25	3.01
D10	P10	0.20	0.22	0.75
D11	P11	0.51	1.38	3.08
D12	P12	0.42	1.16	2.49
D13	P13 ¹	0.56	0.05	1.34
Tributary TOTAL		7.80	18.61	41.80
On-Site TOTAL		9.22	18.89	45.34

Cumulative Design Points

A	CD8 + CD13 + D16 + EXR	4.71	7.21	17.90
DP1A	Proposed Tributary Total	7.85	18.63	41.93
DP1B	IX + DP1A	11.86	26.13	58.33
CD6	P6 + P11 + P12	2.61	8.25	16.53
CD8	P8 + OP8A ^{1,2}	0.81	0.07	1.85
CD10	P10 + OP10A	0.26	0.20	0.72
CD01	OP1 + P8A ^{1,2}	1.60	5.33	10.20
CD02	OP2 + P8B ^{1,2}	0.45	1.86	3.48
CD13	P13 + OP13A ¹	1.17	0.05	1.35

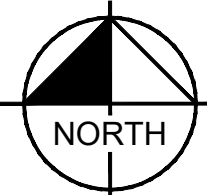
Highlighted Basins are NOT Tributary to Existing Stormwater Facility

²Disturbed Area to be excluded per El Paso County Engineering Criteria Manual 1.7.1.C.1.a (Pr. Disturbed Areas < 1 ac) & 1.7.1.B.2.2 (Pr. Turn Lane < 1 ac)

Tributary TOTAL (DP 1B)	11.86	26.13	58.33
On-Site & Off-Site TOTAL	18.55	40.54	89.93

GRAPHIC SCALE IN FEET

0 25 50 100

WINDERMERE FILING NO. 2 -
PROPOSED CONDITIONS DRAINAGE MAP**Kimley»Horn**

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PHONE: 719-453-0180